SECTION 600 -- INCIDENTAL CONSTRUCTION

SECTION 601 -- GUARDRAIL

601.01 Description. This work shall consist of the fabrication, assembly, and installation of guardrail, guardrail transitions, and guardrail end treatments, in accordance with these requirements, and as shown on the plans. This work may also consist of the extension of existing guardrail with new guardrail, the removal of existing guardrail, or adjusting the height of existing guardrail.

MATERIALS

601.02 Materials. Materials shall be in accordance with the following:

Rail Accessories, Fittings, and Hardware	910.11
Steel Guardrail Posts	910.10
Steel Thrie-Beam Rail	910.09(a)
Steel W-Beam Rail	910.09(a)
Timber Posts and Blocks	911.02(f)

Concrete in anchors shall be class A and in accordance with 702. Sheet signs and sign posts shall be in accordance with 802.

Thrie beam guardrail elements shall be steel and shall be in accordance with the applicable requirements for steel beam guardrail shown in 910.09, 910.10, 910.11, and 910.12.

The components, assembly, post spacing, post lengths, and installation for each location shall be as shown on the plans. Double-facing of the guardrail will be required at the locations shown on the plans.

The base metal thickness of the steel W-beam rail element for a curved guardrail system shall be 3 mm (0.105 in.). The base metal thickness of the steel W-beam terminal connector shall be 3.5 mm (0.138 in.). The wood breakaway posts shall be S4S timber and shall otherwise be in accordance with 911. The curved rail timber posts shall be in accordance with 911. All structural tubing shall be in accordance with ASTM A 500. The remaining steel components shall be in accordance with 910.

CONSTRUCTION REQUIREMENTS

601.03 General Requirements. Posts shall be installed plumb at the spacing and embedment depth shown on the plans. Posts shall be driven where subsurface conditions permit the use of normal driving equipment. Where subsurface conditions prohibit driving the posts, a 300 mm (12 in.) diameter hole shall be bored to the required embedment depth. The hole shall be backfilled with suitable material in 150 mm (6 in.) maximum lifts, compacted as directed, and then the post driven.

Posts damaged during installation shall be repaired or replaced as directed with no additional payment.

When new guardrail is being installed to replace existing guardrail and traffic is to be maintained during the work, the installation of the new guardrail shall follow the removal of the existing guardrail as closely as practical. Adequate safety protection shall be provided as directed between the time that the existing guardrail is removed and the time that the installation of the new guardrail is completed.

When new guardrail is being installed where there is no existing guardrail and traffic is to be maintained during the work, the mounting of the blocks and the rail elements to the posts shall be completed as soon as practical after the posts are installed. The time between the installation of the posts and the mounting of the blocks and rail elements shall not exceed 24 hours. Drums shall be placed to mark all installed guardrail posts left bare overnight. The spacing of these devices shall be numerically equal to the worksite speed limit, but not less than 6 m (20 ft).

All damaged galvanized surfaces shall be coated in accordance with 910.11(a)4.

The nested W-beam guardrail element shall consist of two rail elements, one set inside the other. The length of nested guardrail placed over a culvert shall not be spliced.

601.04 Guardrail Erection. Blocks and rail elements shall be erected in a manner resulting in a smooth, continuous installation. All bolts shall be of sufficient length to extend beyond the nuts and shall be drawn tight. Rail installed along a radius of 46 m (150 ft) or less shall be shop curved. Rail elements shall be lapped as shown on the plans.

601.05 Curved W-Beam Guardrail Systems. This work shall consist of the fabrication, assembly, and installation of specified types of curved W-beam guardrail connector system or curved W-beam guardrail terminal system in accordance with the requirements herein and as shown on the plans.

The installation of the terminal end buffer may utilize an alternate single piece having similar dimensional shape to the terminal end buffer as shown on the plans, and which mates with the W-beam guardrail.

Where the W-beam terminal connector is lapped on the outside of the guardrail, a galvanized 25 mm (1 in.) inside diameter, 51 mm (2 in.) outside diameter, 3.4 mm (0.134 in.) thick, narrow plain washer shall be placed under the splice bolt heads.

Nuts for the anchor cable assembly shall be hand tightened, plus one complete turn at the anchor plate end. All other nuts shall be torqued to 67.8 Nm (50 ft lb).

The installation of the type 5 anchor shall include tightening the cable with the swaged end to eliminate all slack.

The W-beam rail in the type 5 anchor shall be attached to the steel pipe with M16 (5.8 in.) diameter x 32 mm (1 1/4 in.) button head bolt with no washer. Connection to the post will not be required.

601.06 Guardrail Transitions. Guardrail transitions shall be required to connect guardrail to bridge rail, guardrail to piers, and new W-Beam guardrail to existing rub rail type guardrail. The required type of guardrail transition shall be as shown on the plans. The

fabrication, assembly, and installation of thrie-beam components and timber posts and blocks for guardrail transitions type TGB or WGB, and GP will be required at the locations shown on the plans.

601.07 Guardrail End Treatments. Guardrail end treatments shall be required to terminate guardrail installations at the locations shown on the plans. The type of guardrail end treatment, the allowable alternates for each type of guardrail end treatment, the reflectorization of guardrail end treatments, and the grading requirements shall be as shown on the plans.

Double facing of guardrail end treatment type I will be required when it is used in conjunction with double faced guardrail.

When installing end treatments to existing rub rail type guardrail, the rub rail, if not spliced at the last existing post, shall be cut and the end repositioned behind the flange of the post. If the rub rail is spliced at the last existing post, the existing splice material shall be removed and the end of the rub rail repositioned behind the flange of the post. In both cases, the rub rail shall be connected to the post as shown on the plans.

Guardrail end treatments shall be installed within 24 hours of the completion of the guardrail installation to which they are to be attached. Drums in accordance with 801.09 shall be placed for overnight marking of the bare end of the guardrail when the installation of the guardrail end treatment will not be completed until the day following the completion of the guardrail installation to which it is to be attached.

601.08 Extension of Existing Guardrail. Extension of existing rub rail type guardrail with new W-beam guardrail shall require adjusting the post heights in the last 8 m (25 ft) of existing rub rail type guardrail adjacent to the extension as shown on the plans. Guardrail transition type VH shall be used to make this adjustment. The post spacing of the guardrail transition type VH shall equal that of the last 8 m (25 ft) of existing rub rail type guardrail adjacent to the extension. The rub rail shall be terminated at the last existing post in the transition in accordance with 601.06.

601.09 Removal of Existing Guardrail. Removal of existing guardrail shall be in accordance with the applicable requirements of 202 and these requirements. The locations shall be as shown on the plans. When it is specified that the removed guardrail is to become the property of the Department, the rail elements, posts, and blocks shall be removed without being damaged. The removed material shall be stored as directed.

601.10 Adjusting Existing Guardrail Height. The height of the existing guardrail shall be adjusted by the use of moveable blocks as shown on the plans. The height shall be measured to the top of the rail element along the face of the rail. Existing fixed blocks shall be replaced with moveable blocks installed at the proper height. Existing moveable blocks shall be disconnected from the posts and re-mounted at the proper height.

601.11 Resetting Guardrail. This work shall consist of the removal of existing guardrail and, if necessary, storing it, and then re-erecting it where shown on the plans or as directed.

601.12 Method of Measurement. Guardrail, shop curved guardrail, adjusting guardrail height, guardrail removal, and resetting guardrail will be measured by the meter (linear foot) along the top of the rail element, complete in place. Nested guardrail will be measured by the meter (linear foot) along the top of the nested rail elements, complete in place. Guardrail transitions and guardrail end treatments will be measured per each, complete in place. The curved W-beam guardrail connector system and the curved W-beam guardrail terminal system will be measured per each for the type specified. Grading at guardrail end treatments, the reflectorization of guardrail end treatments, and concrete used in anchoring guardrail end treatments will not be measured for payment.

601.13 Basis of Payment. Guardrail will be paid for at the contract unit price per meter (linear foot) for the specified combination of post length and spacing. Nested guardrail will be paid for at the contract price per meter (linear foot) without regard to the post length or spacing. Shop curved guardrail, adjusting guardrail height, guardrail removal, and resetting guardrail will be paid for at the contract unit price per meter (linear foot). Guardrail transitions and guardrail end treatments will be paid for at the contract unit price per each for the type specified. The curved W-beam guardrail connector system and curved W-beam guardrail terminal system will be paid for at the contract unit price per each for the type specified, complete in place.

Where existing guardrail height is adjusted, such work will be paid for at the contract unit price per meter (linear foot). The costs of removal, all necessary storage, new adjustable post brackets, attachment of rail section, and miscellaneous nuts and bolts as required shall be included in the cost of adjust guardrail height.

Payment will be made under:

Metric Pay Item (English Pay Item Pay Item	**Metric Pay Unit Symbol English Pay Unit Symbol) Metric Pay Unit Symbol (English Pay Unit Symbol)**
Guardrail, Adjust Height	m (LFT)
Guardrail Connector System, W-Beam, Curved, _____ type	EACH
Guardrail End Treatment, _____ type	EACH
Guardrail, Remove	m (LFT)
Guardrail, Reset	m (LFT)
Guardrail, Terminal System, W-Beam Curved, _____ type	EACH
Guardrail Transition, _____ type	EACH
Guardrail Transition, VH, _____ m Spacing	EACH
(Guardrail Transition, VH, ___ ft.-___ in. Spacing	EACH)
Guardrail, W-Beam, _____ m Spacing	m
(Guardrail, W-Beam, ___ ft.-___ in. Spacing	LFT)
Guardrail, W-Beam, Double Faced, _____ m Spacing	m
(Guardrail, W-Beam, Double Faced, ___ ft.-___ in. Spacing	LFT)
Guardrail, W-Beam, Long Post, _____ m Spacing	m
(Guardrail, W-Beam, Long Post, ___ ft.-___ in. Spacing	LFT)

Guardrail, W-Beam, Nested.....m (LFT)
Guardrail, W-Beam, Shop Curved, _____ m Spacing .....m
(Guardrail, W-Beam, Shop Curved, ____ Ft.-____ in. spacing.....LFT)

The costs of resetting guardrail shall include the removal, necessary storage, resetting and replacement of damaged or missing parts and new posts as required.

The cost of reflectorization of guardrail end treatments shall be included in the pay items for guardrail end treatments.

SECTION 602 -- CONCRETE BARRIER

602.01 Description. This work shall consist of the construction of concrete barriers and concrete glare screens in accordance with these specifications and as shown on the plans. This work also includes furnishing, placing, maintaining and removing temporary concrete barrier.

MATERIALS

602.02 Materials. Materials shall be in accordance with the following:

Barrier Delineators.....913.08(c)
Bridge Deck Overlay Materials 722.04, 723.04
Cast-in-Place Barriers 702
Cast-in-Place Concrete Glare Screen.....702
Construction Warning Lights.....913.12
Penetrating Sealer.....709, 909.09
Precast Barriers 707
Precast Concrete Glare Screen.....707
Reinforcing Steel.....910.01

CONSTRUCTION REQUIREMENTS

602.03 Concrete Barrier and Concrete Glare Screen. Concrete barrier and concrete glare screen may be precast or cast-in-place. The option selected shall be used continuously throughout the project. Irregular sections shall be cast-in-place regardless of the option selected.

Concrete glare screen may only be precast when constructed in combination with new precast barrier. Concrete glare screen shall be cast-in-place when constructed in combination with cast-in-place barrier, and also when constructed on top of existing concrete barrier.

Excavation and compaction shall be in accordance with 605.03(a). Backfilling shall be in accordance with applicable requirements of 605.03(d).

(a) Precast Concrete Barrier and Concrete Glare Screen. Precast concrete barrier and concrete glare screen shall be constructed in accordance with applicable requirements of 707, except the minimum 28 day compressive strength shall be 20.7 MPa (3000 psi). The precast units shall not be shipped or used until this strength is attained. The

surfaces of individual precast units shall vary no more than 6 mm (0.25 in.) in 3 m (10 ft) from the specified cross section, as measured from a longitudinal straightedge. The maximum variation in the vertical and horizontal alignment of adjacent units shall be 6 mm (0.25 in.) across the joint, as measured from a 3 m (10 ft) longitudinal straightedge. Approved bedding may be used to obtain proper alignment of the concrete barrier sections.

(b) Cast-in-Place Concrete Barrier and Concrete Glare Screen. Cast-in-place concrete barrier and concrete glare screen shall be constructed in accordance with applicable requirements of 706.03 or by the use of an approved slip-form machine. The surfaces of the concrete shall vary no more than 6 mm (0.25 in.) in 3 m (10 ft) from the specified cross section, as measured from a longitudinal straightedge.

(c) Finishing. Concrete barrier and concrete glare screen shall be finished in accordance with 702.21(a). If slip-form construction is used, an approved brush finish will be permitted. Curing material in accordance with 912.01(e) shall be applied as a bond breaker to all areas which result in concrete to concrete contact. It shall be applied at a minimum rate of 1 L/1.8 m^2 (1 gal./75 sq ft). If material is applied at a rate less than the minimum rate, a second application shall be applied.

(d) Sealing. Regardless of the method of construction, all exposed surfaces of the concrete barrier and concrete glare screen shall be sealed in accordance with the applicable requirements of 709.

(e) Joints. The type, size and location of joints and preformed joint filler shall be as shown on the plans.

(f) Reflectorization. All concrete barrier shall be reflectorized with barrier delineators as shown on the plans. All delineators damaged during installation or placement of the concrete barrier shall be replaced with no additional payment. The color of the reflectors shall match the color of the adjacent pavement traffic markings.

602.04 Temporary Concrete Barrier. Temporary concrete barrier shall be precast in accordance with applicable requirements of 707, except that the minimum 28 day compressive strength shall be 20.7 MPa (3000 psi). The precast units shall not be shipped nor used until this strength is attained. The surfaces of individual units shall vary no more than 6 mm (0.25 in.) in 3 m (10 ft) from the specified cross section, as measured from a longitudinal straightedge.

(a) Placement. Temporary concrete barrier shall be located as shown on the plans or as directed. Temporary concrete barrier located along a tapered alignment shall be flared at the rates as shown on the plans for the applicable regulatory speed within the construction zone. If field conditions are such that the required flare rate cannot be utilized, the tapered alignment may be altered, with approval, to a 10:1 flare rate with a 6 m (20 ft) minimum offset from the edge of the through traffic lane to the approaching end of the flared temporary concrete barrier. If field conditions are such that the 10:1 flare rate cannot be utilized, the tapered alignment may be further altered, with approval, to a 6:1 flare rate with the 6 m (20 ft) minimum offset. The use of flare rates sharper than those shown on the plans may require additional traffic control devices as directed.

(b) Connection. Temporary concrete barrier sections shall be connected as follows:

1. The adjacent barrier sections shall be placed end to end, with sufficient overlapping of the smooth bar hooks to allow placement of the connecting bolt or threaded rod and the top spacer.

2. The adjacent barrier sections shall then be moved in opposite directions for a sufficient distance to develop the maximum contact between the smooth bar hooks and the connecting bolt or threaded rod.

3. The bottom spacer and nut shall then be placed as shown on the plans. The nut shall be sufficiently tightened to eliminate all gaps between the adjacent bolt heads, spacers, nuts, and washers which form the connection.

(c) Anchorage. Temporary concrete barrier shall be anchored in accordance with the methods shown on the plans, at the locations described herein. Temporary concrete barrier shall be anchored when located on or within 18 m (60 ft) of a bridge, and along tapered alignments. Anchoring at locations in addition to those described herein will be required when directed.

Chemical anchor systems with removable bolts, or mechanical anchors may be used to anchor temporary concrete barrier to bridge decks, concrete pavement, and concrete shoulders. Mechanical anchors may be ferrous or non-ferrous material. All anchors shall have a shear strength of 44.5 kN (10,000 lb) and an ultimate pullout strength of 29 kN (6,500 lb).

Non-ferrous mechanical anchors shall be installed such that the top end of the sleeve is a minimum of 60 mm (2 1/2 in.) below the final finished concrete surface.

Ferrous mechanical anchors shall be completely removed when no longer required. All damage to the concrete shall be repaired as directed with no additional payment.

Non-ferrous anchor sleeves and the chemical adhesive component of chemical anchor systems may remain in place when no longer required. The holes remaining in the concrete, after the removal of the bolts used with non-ferrous mechanical anchors and chemical anchor systems, shall be filled with appropriate material as directed, with no additional payment.

(d) Delineation. Temporary concrete barriers shall be delineated with type C construction warning lights and barrier delineators as shown on the plans. Bi-directional lenses shall be required on type C construction warning lights when the barrier is used to separate opposing traffic or when the barrier is adjacent to a lane that is carrying alternating one way traffic. The color of the barrier delineators shall be white when located on the right side of the traffic lane, and yellow when located on the left side of the traffic lane.

602.05 Method of Measurement. Concrete barrier will be measured by the meter (linear foot) along the centerline of the barrier, including irregular barrier sections around median obstructions such as bridge piers. Barrier delineators will be measured per each

provided there is a pay item shown in the Schedule of Pay Items. Concrete glare screen will be measured by the meter (linear foot) along the centerline of the glare screen.

Temporary concrete barrier will be measured by the meter (linear foot). Anchored temporary concrete barrier will be measured by the meter (linear foot), separately from unanchored temporary concrete barrier.

602.06 Basis of Payment. Concrete barrier will be paid for at the contract unit price per meter (linear foot), complete in place. Barrier delineators used on concrete barrier will be paid for at the contract unit price per each, complete in place.

Concrete glare screen will be paid for at the contract unit price per meter (linear foot), complete in place.

Temporary concrete barrier and anchored temporary concrete barrier will be paid for at the contract unit price per meter (linear foot). Payment will be made only once, regardless of the number of times the barrier is moved to accommodate different phases of traffic maintenance or construction operations.

Payment will be made under:

Pay Item	**Pay Unit Symbol**
Pay Item	**Metric Pay Unit Symbol (English Pay Unit Symbol)**
Barrier Delineator	EACH
Concrete Barrier	m (LFT)
Concrete Barrier Glare Screen	m (LFT)
Temporary Concrete Barrier	m (LFT)
Temporary Concrete Barrier, Anchored	m (LFT)

The costs of surface seal or curing-sealing material for concrete barrier and curing material shall be included in the cost of concrete barrier.

The cost of delineation of temporary concrete barrier shall be included in the cost of temporary concrete barrier.

SECTION 603 -- FENCES

603.01 Description. This work shall consist of the construction of fence and gates in accordance with these specifications and in reasonably close conformance with the lines and grades shown on the plans or as directed.

MATERIALS

603.02 Materials. Materials shall be in accordance with the following:

Barbed Wire	910.18(b)4
Chain Link Fabric	910.18(b)
Concrete, Class A or B	702
Concrete, packaged dry	913.07
Fence Posts	910.13
Gates	910.18(d)
Tension Wire	910.18(b)1
Woven Wire	910.18(a)

CONSTRUCTION REQUIREMENTS

603.03 General Requirements. Clearing and grubbing shall be performed as necessary to construct the fence to the required grade and alignment.

At locations where breaks in a run of fencing are required, or at intersections with existing fences, appropriate adjustment in post spacing shall be made in accordance with the requirements for the type of closure indicated.

When the plans require that posts, braces, or anchors be imbedded in concrete, temporary guys or braces shall be installed, if required to hold the posts in proper position, until such time as the concrete has set sufficiently to hold the posts. Unless otherwise permitted, no materials shall be installed on posts or strain placed on guys and bracing set in concrete until four days have elapsed from the time of placing of the concrete.

The tops of all posts shall be set to the required grade and alignment. Cutting of the tops of the posts will be allowed only with approval and under the conditions specified.

Wire or fencing of the size and type required shall be firmly attached to the posts and braces in the manner indicated. All wires shall be stretched taut and installed to the required elevations.

At each location where an electric transmission, distribution, or secondary line crosses any of the types of fences covered by these specifications, a ground, conforming to applicable requirements of the National Electric Safety Code, shall be furnished and installed.

603.04 Setting Posts. Unless otherwise directed, posts, including the concrete base for posts, shall be set so that the entire fence is inside the right-of-way and such that the fence can be placed on the side of the post facing the pavement. If an object, such as a tree, is located on the right-of-way and is to remain in place, the fence may be set off line enough

to miss the object. There shall be a gradual offset for at least three posts in each direction to eliminate sharp bends.

Line posts for farm field type fence shall be set on 5 m (16 ft) maximum centers, and those for chain link type on 3 m (10 ft) centers. In either case, a tolerance of ∀ 0.6 m (2 ft) in spacing will be allowed at special locations as approved. Spacing of these posts shall be as uniform as practicable under the existing conditions. However, additional posts shall be set at each abrupt change in grade.

Pull posts shall be set at 150 m (500 ft) maximum intervals in straight runs and at each vertical angle point of 10 degrees or more.

Corner posts shall be set at each horizontal angle point of 10 degrees or more.

End, corner, and pull posts for both types of fence, line posts for chain link type fence and diagonal braces for farm field type fence shall be set in concrete as shown on the plans.

Except where rock is encountered, intermediate or line posts shall be driven and furnished with an approved anchor plate or other satisfactory device to hold the post in proper alignment and plumb. The plate or anchor shall be satisfactorily welded or riveted with no less than two rivets to the post.

Gate posts shall be set in concrete as shown on the plans.

Extra length posts shall be required at stream crossings as shown on the plans or as directed and also at small ground depressions where it is not practicable for the fencing to follow closely the contour of the ground. These posts shall be set in concrete as shown on the plans.

When so directed, at small stream crossings and ground depressions, the space below the fence fabric shall be closed with barbed or ground tension wire, either on horizontal lines or fanned, as shown on the plans or as directed. The wires shall be stretched taut between and fastened to the posts to prevent vertical movement of the wires. Barbed or tension wire shall not be required where its installation would cause collecting drifts in the channel.

603.05 Placing Barbed and Tension Wire and Fabric. The bottom of the fabric shall be placed above the ground line as shown on the plans. Over irregular ground, a minimum of 25 mm (1 in.) and a maximum of 150 mm (6 in.) clearance will be permitted for the maximum distance shown on the plans. All necessary excavation and backfilling required shall be performed in accordance with these provisions.

The tension required to stretch the fabric and wire shall be applied by mechanical fence stretchers and with single wire stretchers designed and manufactured for the purpose, and in accordance with the fence manufacturer's recommendations.

All splices in the fabric and wire shall be securely made in accordance with the best practice and the manufacturer's recommendations, and by the use of tools designed for that purpose.

Farm field fence shall be placed by fastening one end and then applying sufficient tension to remove all slack before making permanent attachments elsewhere. The line wires shall be fastened to end, corner, and pull posts by wrapping the wires around the posts and tying the wire back on itself with no less than 1 1/2 tightly wrapped twists. Such tying shall be done with tools designed for the purpose in accordance with the fence manufacturer's recommendations. This same method shall be used in placing barbed or tension wire. Fence fabric shall be fastened to intermediate or line posts with at least five wire ties or other satisfactory methods. Barbed or tension wire shall be fastened in the same manner with one satisfactory fastening device for each post.

The top and bottom tension wires of chain link fence shall be placed, stretched taut, and secured at the ends and to all posts in a satisfactory manner before the fabric is placed. The ends of the fabric shall be secured by the use of stretcher-bars threaded through the loops of the fabric and secured to the posts by means of clamps with bolts and nuts. The number of clamps shall be as indicated on the plans. The fabric shall be placed by securing one end and then applying tension to remove all slack before making attachments elsewhere. The fabric shall be fastened to the line posts and to the top and bottom tension wires with tie wires or aluminum bands spaced as shown on the plans.

603.06 Resetting Fence. Resetting fence shall consist of the removal of existing fence within the limits of the new improvement and, if necessary, storing it in a careful manner and then resetting it when so shown on the plans, or as otherwise directed. Resetting shall be in accordance with applicable provisions of this specification for setting new fence and shall include the replacement of damaged or missing parts, including posts.

603.07 Method of Measurement. Fence and resetting fence will be measured by the meter (linear foot). Measurement will be made along the top of the fence from outside to outside of end posts for each continuous run of fence.

Gates will be measured as complete units of the size and type specified.

603.08 Basis of Payment. The accepted quantities of fence and resetting fence will be paid for at the contract unit price per meter (linear foot). Gates will be paid for at the contract unit price per each for fence gate, of the type and size specified, complete in place.

Payment will be made under:

Metric Pay Item (English Pay Item Pay Item	**Metric Pay Unit Symbol English Pay Unit Symbol) Metric Pay Unit Symbol (English Pay Unit Symbol)**
Fence, _____, _____ mm (type, height)	m

(Fence, _____, _____ in. ..... LFT)
type height
Fence, _____, Reset ..... m (LFT)
type
Fence, Farm Field, Barbed Wire, _____ mm ..... m
(Fence, Farm Field, Barbed Wire, _____ in. ..... LFT)
Fence, Farm Field, Tension Wire, _____ mm ..... m
(Fence, Farm Field, Tension Wire, _____ in. ..... LFT)
Fence Gate, _____, _____ mm x _____ m ..... EACH
type height length
(Fence Gate, _____, _____ in. x _____ ft. ..... EACH)
type height length

SECTION 604 -- SIDEWALKS, CURB RAMPS AND STEPS

604.01 Description. This work shall consist of HMA or portland cement concrete sidewalks; curb ramps; concrete steps; or the reconstruction of portland cement concrete sidewalks in accordance with 105.03.

MATERIALS

604.02 Materials. Materials shall be in accordance with the following:

Coarse Aggregate, Class D or Higher, size No. 53 ..... 904.02
Concrete, Class A 702
Fine Aggregate, size No. 23 or No. 24 ..... 904.01
Joint Filler 906.01
Reinforcing Steel 910.01

CONSTRUCTION REQUIREMENTS

604.03 Portland Cement Concrete Sidewalks and Curb Ramps.

(a) General Requirements. The location of curb ramps shall take precedence over the location of drainage structures and signal, utility, or light poles. Drainage structures shall not be located within the limits of the curb ramp, exclusive of flared sides and warped or rolled edges. Poles shall be located so as not to impede the usage or safety of the curb ramps. Curb ramps shall be aligned with the sidewalk and the crosswalk. Crosswalk markings shall be located such that the curb ramps, exclusive of flared sides or warped or rolled edges, shall be contained within the markings, unless otherwise specified. The normal gutter flow line shall be maintained throughout the curb ramp area, and appropriate drainage structures shall be used, as needed, to intercept the flow prior to the curb ramp area. Positive drainage shall also be provided to carry water away from the intersection of the curb ramp and the gutter line.

The curb ramp running slope shall not exceed 12:1. Curb ramp cross slope shall not exceed 50:1 except where site infeasibility makes it impossible to comply.

Rolled or warped edges shall be used only where ramps are adjacent to utility strips or large obstructions.

(b) Excavation. Excavation shall be made to the required depth and to a width that will permit the installation and bracing of the forms. The foundation shall be shaped and compacted to a firm even surface in accordance with the section shown on the plans. All soft and yielding material shall be removed and replaced with acceptable material.

(c) Forms. Forms shall be of wood, metal, or other approved material and shall extend for the full depth of the concrete. Forms shall be straight, free from warp, and of sufficient strength to resist the pressure of the concrete without springing. Bracing and staking of forms shall be such that the forms remain in both horizontal and vertical alignment until their removal.

(d) Placing Concrete. The foundation shall be thoroughly moistened immediately prior to the placing of the concrete. The proportioning, mixing, and placing of the concrete shall be in accordance with 702 for class A concrete. The thickness of the concrete in the curb ramp, including flared sides and warped or rolled edges, shall be as shown on the plans for the type specified.

(e) Finishing. The surface shall be finished with a wooden float. No plastering of the surface will be permitted. The final surface texture of the curb ramps shall be rougher than the adjacent sidewalk. The striations shall be transverse to the ramp slopes and shall be obtained by coarse brooming or by another approved method.

All exposed edges shall be edged with a 6 mm (0.25 in.) radius edging tool.

(f) Joints. The type and location of joints and the size of preformed joint filler shall be as shown on the plans.

Contraction joints shall be formed with a 6 mm (0.25 in.) radius jointing tool. All other joints shall be edged with a 6 mm (0.25 in.) radius edging tool.

Preformed 13 mm (0.50 in.) joint filler shall be placed around all appurtenances, such as manholes and utility poles which extend into and through the sidewalk, and between the sidewalk and any fixed structure, such as a building or bridge. The preformed joint filler shall extend for the full depth of the sidewalk or curb ramp, and shall be flush with the surface of the adjacent concrete.

(g) Curing. Concrete shall be cured for at least 72 hours. Curing shall be by means of moist burlap or mats or by other approved methods. During the curing period all pedestrian traffic shall be excluded.

604.04 Portland Cement Concrete Steps. Portland cement concrete steps shall be in accordance with the applicable provisions of 604.03. In addition, all exposed edges shall be rounded to a 6 mm (0.25 in.) radius.

604.05 Reconstructed Portland Cement Concrete Sidewalk. Where existing concrete sidewalk is to be reconstructed, all disintegrated concrete, brick, stone, or other material shall be completely removed and replaced with new concrete sidewalk in accordance with this specification.

Such sidewalk shall be constructed to a minimum depth of 100 mm (4 in.) unless another depth is designated and to the width of the adjoining walk, or to a width of no less than 450 mm (18 in.) from the face of curb, or to such other width as directed.

The removal of concrete sidewalk shall be to uniform lines as directed. The sidewalk to be removed shall be cut in a straight line with an approved power driven concrete saw. The sawing shall be such that the portion of sidewalk to remain in place shall not be damaged. All portions which are damaged or removed back of the established line shall be replaced.

Unless otherwise directed, sidewalk which must be removed shall be removed between tool marks or joints. At locations where the sidewalk and curb are adjacent and the curb is deteriorated, the curb shall also be replaced as directed.

The new sidewalk shall have a joint pattern similar to the surrounding sidewalk. Sidewalk placed at drives shall be 150 mm (6 in.) thick, or the same depth of the existing drive, whichever is greater.

604.06 Re-Laid Portland Cement Concrete Sidewalk. This work consists of the removal and re-laying of concrete, stone-slab, or brick sidewalk at the locations shown on the plans or as directed. In the operations of removing and re-laying, care shall be taken not to damage any of the sidewalk. Before re-laying, a cushion of No. 23 or No. 24 fine aggregate shall be spread on the prepared subgrade to a depth of no less than 50 mm (2 in.) and the sidewalk relaid thereon. The entire section shall rest firmly on the sand base. Cracked or damaged sections shall not be relaid but shall be disposed of as directed.

604.07 HMA Sidewalk.

(a) Excavation and Forms. Excavation and forms, when required, shall be in accordance with 604.03(a) and 604.03(b).

(b) Bed Course. Bed course material shall be coarse aggregate size No. 53 and shall be placed in layers not exceeding 100 mm (4 in.) in depth. Each layer shall be thoroughly compacted.

(c) Placing HMA Sidewalk. HMA sidewalk material shall be in accordance with 402 and placed on a compacted bed course in one or more courses as indicated so as to give the required depth when rolled. The mixture shall consist of HMA base, intermediate, or surface. Mixture adjustments in accordance with 904.02(a) will not apply. Aggregate requirements of 904.02(d) do not apply. Compaction shall be accomplished by means of a hand operated or power roller of an acceptable type and mass (weight). In areas inaccessible to the roller, hand tamping will be permitted. In any case, the HMA sidewalk material shall be uniformly compacted.

If the finished compacted surface is too open or remains sticky, the surface shall be given a coating of No. 23, well broomed over the surface, leaving no excess.

604.08 Backfilling and Finishing Shoulders and Slopes. After forms have been removed, the space on each side of the sidewalks shall be filled to the required elevation

with suitable material which shall be firmly compacted and neatly graded. Adjacent shoulders and slopes shall be finished to the required grade and cross section.

604.09 Method of Measurement. Reconstructed concrete sidewalks and re-laid concrete sidewalks will be measured by the square meter (square yard) of finished surface. HMA for sidewalks will be measured by the megagram (ton) of HMA mixture placed. Bed course material will be measured by the megagram (ton).

Concrete curb ramps will be measured by the square meter (square yard).

Concrete steps will be measured by the cubic meter (cubic yard) based on the neat lines shown on the plans.

604.10 Basis of Payment. The accepted quantities of concrete sidewalk will be paid for at the contract unit price per square meter (square yard) for sidewalk, concrete. HMA for sidewalk will be paid for at the contract unit price per megagram (ton), complete in place. Bed course material will be paid for at the contract unit price per megagram (ton). Concrete steps will be paid for at the contract unit price per cubic meter (cubic yard) for steps, concrete. Reconstructed sidewalk and relaid sidewalk will be paid for at the contract unit price per square meter (square yard) for sidewalk, reconstruct, or sidewalk, re-lay. Joint material will be paid for at the contract unit price per meter (linear foot), complete in place.

The accepted quantities of curb ramps will be paid for at the contract unit price per square meter (square yard) for curb ramp, concrete, complete in place.

Reinforcement, if used, will be paid for in accordance with 703. Curb, if directed to be replaced, will be paid for in accordance with 605.10.

Payment will be made under:

Pay Item	Metric Pay Unit Symbol (English Pay Unit Symbol)
Bed Course Material	Mg (TON)
Curb Ramp, Concrete	m2 (SYS)
Joint Material	m (LFT)
Sidewalk, HMA	Mg (TON)
Sidewalk, Concrete	m2 (SYS)
Sidewalk, Concrete, Reconstruct	m2 (SYS)
Sidewalk, Concrete, Re-Lay	m2 (SYS)
Steps, Concrete	m3 (CYS)

The costs of excavation, backfill, expansion joint material, and necessary incidentals shall be included in the costs of the pay items.

The removal and disposal of concrete sidewalk which is unsuitable for re-laying and which has not been damaged due to negligence will be paid for in accordance with 202.13. Concrete sidewalk which is specified to be re-laid or to remain in place and which is damaged shall be removed and disposed of and replaced with no additional payment.

If directed, concrete sidewalk shall be constructed to a depth greater than that shown on the plans. Such additional thickness will be converted into the equivalent square meters (square yards) quantity of concrete sidewalk of the thickness shown on the plans and will be paid for as such.

The cost of furnishing and applying sand to finished compacted surfaces shall be included in the cost of sidewalk, HMA.

SECTION 605 -- CURBING

605.01 Description. This work shall consist of the construction of curb or curb turnouts; combination curb and gutter, combined curb and gutter turnouts; or resetting curb in accordance with these specifications and in reasonably close conformance with the lines and grades shown on the plans or as directed.

MATERIALS

605.02 Materials. Materials shall be in accordance with the following:

Coarse Aggregate, Class D or Higher, size No. 53 .....904.02
Concrete 702
Joint Materials 906
Joint Mortar 906.03
Precast Concrete Curbing.....913.05
Reinforcing Steel.....910.01

Concrete used to construct curb or combination curb and gutter shall incorporate Class AP, size No. 8 for its coarse aggregate.

605.03 Precast Cement Concrete Curbing.

(a) Excavation. Excavation shall be made to the required depth and the base upon which the curb is to be set shall be compacted to a firm even surface. All soft and unsuitable material shall be removed and replaced with suitable material which shall be thoroughly compacted.

(b) Installation. The curb shall be set in accordance with the line and grade required. The face and top of the curb shall be checked with a 3 m (10 ft) straightedge. Portions showing irregularities of 6 mm (0.25 in.) or more shall be removed and replaced with no additional payment. All spaces under the curbing shall be filled with bed course material. The bed course material shall be coarse aggregate, size No. 53 and shall be thoroughly tamped.

(c) Joints. Curbing shall be laid with joints as indicated on the plans. These joints shall be filled with mortar as specified. Where a portland cement concrete pavement is to be constructed contiguous to a curbing, joints shall be constructed in the curbing directly in line with pavement expansion joints. The joint in the curbing shall be the same width as the pavement joint and shall be filled with an expansion joint filler of the same nominal thickness as the pavement joint. Any voids between the joint filler and the curb shall be filled with mortar.

(d) Backfilling. After the curb has set, any remaining excavated areas shall be filled with approved material. This material shall be placed and thoroughly tamped in layers not exceeding 150 mm (6 in.) in depth.

605.04 Cast in Place Cement Concrete Curbing.

(a) Excavation. Excavation and bedding shall be in accordance with 605.03(a).

(b) Forms. Forms shall be of wood or metal, straight, free from warp, and of such construction that there will be no interference to the inspection of grade or alignment. All forms shall extend for the entire depth of the curb and shall be braced and secured sufficiently so that no deflection from alignment or grade shall occur during the placing of the concrete.

(c) Proportioning and Placing. Concrete shall be proportioned, mixed, and placed in accordance with the requirements for the class of concrete specified. Where integral curb and gutter is specified, that portion of the curb below the upper surface elevation of the adjoining pavement shall be constructed by extending the pavement to the outer vertical plane of the curb at the time the pavement is placed. The concrete used in this extension shall be the same composition as that of the pavement.

The upper portion of the curb shall be of class A concrete in accordance with in 702. After the concrete for the upper portion is placed in the forms, it shall be tamped and spaded or vibrated until mortar entirely covers the surface. The top shall be floated smooth and the outer upper corner rounded to a 6 mm (0.25 in.) radius.

The face and top of the curb, integral curb, gutter, and sidewalk shall be checked with a 3 m (10 ft) straight edge. Portions showing irregularities of 6 mm (0.25 in.) or more shall be removed and replaced.

Consolidation of concrete placed in the forms shall be by vibration or other acceptable methods. Forms shall be left in place for 24 hours or until the concrete has set sufficiently so that they can be removed without injury to the curbing. Upon removal of the forms, the exposed curbing face shall be rubbed immediately to a uniform surface. Rubbing shall be accomplished by the use of water and a carborundum brick. For the purpose of matching adjacent concrete finishes or for other reasons, other methods of finishing may be permitted. No plastering will be permitted.

(d) Curb Turnouts and Combined Concrete Curb and Gutter Turnouts. Turnouts will be required with specified inlets or with concrete gutter and paved side ditch in accordance with 607 and as shown on the plans. Concrete gutter and paved side ditch shall be constructed monolithically with the curb turnout.

(e) Joints. Where the adjacent pavement contains joints, such joints shall be continued through integral curb. Pavement contraction joints shall be carried through integral curb with preformed joint material 6 mm (0.25 in.) thick, shall be in accordance with the cross section of the curb, and shall be set perpendicular to the face and top of the curb. Preformed expansion joints shall be placed at the beginning and end of all curb returns and also at castings.

Curbing not constructed integral with adjacent pavement shall be constructed with intermediate joints located at 3 m (10 ft) intervals. These joints may be sawed or formed with metal separator plates, and the depth and width shall be in accordance with the plans. Preformed expansion joints, 6 mm (0.25 in.) thick, shall be placed at the beginning and end of all curb returns and also at castings.

(f) Curing. Immediately upon completion of the rubbing, the curbing shall be moistened and kept moist for 3 days, or cured by the use of membrane forming material. The method and details of curing shall be subject to approval.

(g) Backfilling. After the concrete has set sufficiently, the spaces in front and back of the curb shall be refilled with suitable material to the required elevation in layers of not more than 150 mm (6 in.) and be tamped thoroughly.

(h) Curb Machine. Curb machines may be used to construct curb provided the curb can be constructed to the requirements of the specifications.

(i) Integral Curb Walk. If integral curb walk is specified, it shall be constructed as shown on the plans using class A concrete in accordance with 702. Reinforcing steel shall be in accordance with 703.

605.05 Reflecting Cement Concrete Curbing. Construction methods for this item shall be in accordance with 605.03 and the following requirements.

The reflecting surface of the curbing shall be a mortar mix consisting of one part white portland cement to 1 3/4 parts of light colored, washed, mortar sand. This mortar mix shall have a thickness of approximately 25 mm (1 in.). Alternately, the entire curbing may constructed of concrete made with white portland cement.

Washed mortar sand shall meet all the requirements for mortar sand and shall be of a light satisfactory color. The reflecting surface mortar shall be placed immediately after the placing of the base concrete. No more than 20 minutes shall elapse between the placing of the base concrete and the placing of the reflecting surface.

Scoring or surface deformation and finish of the reflecting surface shall be in accordance with the details shown on the plans.

605.06 Cement Concrete Center Curbing. The subgrade shall be prepared the same as for the adjoining pavement. If subbase is provided for the adjoining pavement, it shall be carried through for the full width of the curb and at the same thickness as that for the pavement.

Class A concrete in accordance with 702 shall be used.

The temperature limitations of 501.10 shall apply to placing the concrete. The surface shall be troweled smooth with a metal trowel. Curing shall be in accordance with 501.17.

Forms shall be removed within 24 hours after the concrete has been placed. Plane surfaces and exposed sides of the curb shall be checked with a 3 m (10 ft) straightedge. Portions showing irregularities of 6 mm (0.25 in.) or more shall be removed and replaced in compliance with these specifications.

If adjacent to cement concrete pavement, 10 mm (3/8 in.) expansion joints shall be placed through the center curb opposite contraction joints in the pavement. If adjacent to asphalt pavement, 10 mm (3/8 in.) expansion joints shall be spaced at 12 m (40 ft) intervals. The material used shall be in accordance with 906. Intermediate joints, 8 mm (1/3 in.) in depth, shall be placed at 6 m (20 ft) intervals.

Where an expansion joint is constructed in cement concrete pavement adjacent to concrete center curb, the expansion joint shall be carried through the center curb in accordance with applicable requirements of 501.14(c).

605.07 HMA Curbing.

(a) Excavation. Excavation shall be in accordance with 605.03(a).

(b) Preparation of Bed. When curbing is to be constructed on a fresh laid HMA surface, the curb may be laid only after the surface has been cleaned.

When curbing is to be constructed on a cured or aged portland cement concrete base, asphalt pavement, or asphalt treated base, the bed shall be thoroughly swept and cleaned with compressed air. The surface shall be thoroughly dried and, immediately prior to placing of the HMA mixture, shall receive a tack coat in accordance with 406. During application, the spread of this tack coat to areas outside of the area to be occupied by the curb shall be prevented.

(c) Mixture. Unless otherwise specified, the HMA mixture shall be in accordance with 402 for HMA surface 9.5 mm, except that the percent passing the 75 Φm (No. 200) sieve shall be between 3.0 and 9.0 percent, the minimum percent crushed shall be 95 percent, and the binder content shall be 7.0 percent. Mixture adjustments in accordance with 904.02(a) will not apply. Aggregate requirements of 904.02(d) do not apply. Weather limitations shall be in accordance with 402.10.

(d) Placing. HMA curbing shall be constructed by use of a self-propelled automatic curber, curb machine or paver with curbing attachments. The curbing shall be in accordance with the section shown on the plans. The automatic curber or machine shall meet the following requirements and shall be approved prior to its use.

1. The weight of the machine shall be such that required compaction is obtained without the machine riding above the bed on which curbing is being constructed.

2. The machine shall form curbing that is uniform in texture, shape, and density.

The construction of curbing by means other than the automatic curber or machine may be permitted when short sections or sections with short radii are required, or for such

other reasons as may seem warranted. The resulting curbing shall conform in all respects to the curbing produced by the use of the machine. The face and top of the HMA curb shall be checked with a 3 m (10 ft) straightedge. Portions showing irregularities of 6 mm (0.25 in.) or more shall be removed and replaced.

(e) Painting and Sealing. When sealing or painting is required, it shall be performed only on a curbing which is clean and dry and which has reached the ambient temperature.

200

605.08 Resetting Curbing.

(a) Salvage of Curbing. Curbing specified for resetting shall be cleaned, removed, and stored. Any existing curbing that is to be reset which is lost, damaged, or destroyed as a result of operations or because of failure to store and protect it in a manner that would eliminate its loss or damage, shall be replaced.

(b) Curb Removal. Curbing, which is unsuitable for resetting and which has not been damaged due to negligence, shall be removed and disposed of as directed.

210

(c) Excavation. Excavation and bedding shall be in accordance with 605.03(a).

(d) Resetting. The curb shall be set on a firm bed in accordance with the required line and grade. All sections of curbing shall be set so that the maximum opening between adjacent sections is 20 mm wide (0.75 in.) for the entire exposed top and face. Any dressing of the ends of the curbing necessary to meet this requirement shall be done as needed. Cutting or fitting may be necessary in order to install the curbing at the locations as directed.

220 After the curb has been set, the joints shall be completely filled with mortar as specified.

(e) Backfilling. The spaces in front and back of the curb shall be refilled to the required elevation with suitable material. This material shall be tamped thoroughly in layers of not over 150 mm (6 in.) in depth.

605.09 Method of Measurement. Curbing, both new and reset, and curb removal will be measured by the meter (linear foot) along the front face of the section at the finished grade elevation. Combined curb and gutter will be measured along the face of the curb. Curb
230 turnout will be measured longitudinally by the meter (linear foot) as curb of the type specified, from the ends of the radii which touch the front face of the longitudinal curb portion. Combined curb and gutter turnout will be measured longitudinally by the meter (linear foot) as curb and gutter of the type specified, from the ends of the radii which touch the front face of the longitudinal curb portion. No deduction in length will be made for drainage structures installed in the curbing such as catch basins or drop inlets. Concrete center curb will be measured by the meter (linear foot), unless it is of variable width, in which case measurement will be by the square meter (square yard). Integral curb walk will not be measured for payment. The quantity to be paid for will be that shown on the plans. Reinforcing steel for integral curb walk will be measured in accordance with 501.25.

240

Bed course material will be measured by the megagram (ton).

605.10 Basis of Payment. The accepted quantities of curb work will be paid for at the contract unit price per meter (linear foot) for curb; curb and gutter; curb, reset; or center curb, of the type specified. Variable width center curb will be paid for at the contract unit price per square meter (square yard) for center curb, of the width specified. Bed course material will be paid for at the contract unit price per ton, complete in place.

Integral curb walk will be paid for at the contract unit price per cubic meter (cubic yard) for concrete, A, structures for the quantity shown on the plans.

Reinforcing steel for integral curb walk will be paid for in accordance with 501.26. The portion of expansion joint contained in the center curb will be paid for in accordance with 501.26.

Curb turnout will be paid for at the contract unit price per meter (linear foot) of the type of curb specified. Combined curb and gutter turnout will be paid for at the contract unit price per meter (linear foot) for curb and gutter of the type specified.

Payment will be made under:

Pay Item	**Metric Pay Unit Symbol (English Pay Unit Symbol)**
Bed Course Material	Mg (TON)
Center Curb, _____ type	m (LFT)
Center Curb, _____ m width	m2
(Center Curb, _____ ft. width	SYS)
Curb, _____ type	m (LFT)
Curb and Gutter, _____ type	m (LFT)
Curb, Remove	m (LFT)
Curb, Reset, _____ type	m (LFT)

The cost of tack coat reinforcing steel or mesh reinforcement for curb, curb and gutter, or center curb shall be included in the costs of the pay items. The costs of replacement curb portions for those which show irregularities of 6 mm (0.25 in.) or more shall be included in the cost of curb.

SECTION 606 -- Blank

SECTION 607 -- PAVED SIDE DITCH OR CONCRETE GUTTER

607.01 Description. This work shall consist of placing a portland cement concrete lining, gutter, or reinforced concrete gutter turnout for side ditches in accordance with these specifications and in reasonably close conformance with the lines, grades, and dimensions shown on the plans or as directed.

MATERIALS

607.02 Materials. Materials shall be in accordance with the following:

Concrete, Class A	702
Reinforcing Steel	910.01

CONSTRUCTION REQUIREMENTS

607.03 General Requirements. The excavation shall be to the required depth and shape of the bottom of the type and size of the side ditch being constructed, the details of which are shown on the plans. All soft, yielding, or unsuitable materials encountered at the required excavation elevation shall be removed and replaced with approved materials which shall be compacted and finished to a firm, smooth surface.

The applicable requirements of 605.04(b) shall apply to forms.

Placing, finishing, and curing shall be in accordance with 605.04 except the curing period shall be no less than 72 hours. The finished surface need not be brushed.

Reinforcement will be required for all paved side ditch, cut-off-walls, and lugs as shown on the plans.

Paved side ditch transitions will be required at intersections with earth ditches and pipe culverts.

Transitions of 3 m (10 ft) or less will be required between two different types of paved side ditches.

Cut-off wall and lug details shall be as shown on the plans. A cut-off wall shall be constructed at the beginning and end of any paved side ditch. Lugs shall be poured monolithic with paved side ditch on steep grades. Their locations shall be as shown on the plans or as otherwise directed. Backfilling shall be in accordance with 605.04(g).

607.04 Cement Concrete Gutter and Turnout. Concrete gutter and concrete gutter turnout shall be constructed as shown on the plans or where directed. Construction shall be in accordance with all applicable requirements set out herein for paved side ditch.

607.05 Method of Measurement. Paved side ditch or cement concrete gutter will be measured by the meter (linear foot) along the centerline of the ditch per each type specified. Each cutoff wall or lug will be measured as 2.4 m (8 linear feet) of paved side ditch or cement concrete gutter. Paved side ditch transitions at earth ditches and pipe culverts will be measured as equivalent lengths in meters (linear feet) of the paved side ditch specified at each location. Transitions at the intersection of two different types of paved side ditch will be converted to equivalent lengths in meters (linear feet) of the larger type of paved side ditch specified at each site.

Reinforced concrete gutter turnout will be measured as 15 m (50 lft) of concrete gutter. Additional length, if required, will be measured by the meter (linear foot) of concrete gutter.

607.06 Basis of Payment. The accepted quantities of paved side ditch or cement concrete gutter of the type specified, including transitions, cutoff walls and lugs measured in accordance with 607.05, will be paid for at the contract price per meter (linear foot) complete in place. Concrete gutter turnout will be paid for at the contract unit price per meter (linear foot) for gutter, concrete, of the type specified.

Payment will be made under:

Pay Item	**Metric Pay Unit Symbol (English Pay Unit Symbol)**
Gutter, Concrete, _____ type	m (LFT)
Paved Side Ditch, _____ type	m (LFT)

The costs of reinforcing steel or mesh, excavation, joints, and necessary incidentals shall be included in the costs of the pay items.

SECTION 608 -- SHOULDER DRAINS

608.01 Description. This work shall consist of constructing shoulder drains in accordance with these specifications and in reasonably close conformance with the lines and grades shown on the plans or as directed.

MATERIALS

608.02 Materials. Materials shall be in accordance with the following:

Coarse Aggregates, Class A, B, C, or D,
Size No. 8.....904.02

CONSTRUCTION REQUIREMENTS

608.03 General Requirements. Unless otherwise designated, shoulder drains shall be installed on both sides of the pavement by trenching from the edges of the pavement through the shoulders and backfilling with aggregate at low points in the grade and at other locations when so directed. This work shall precede the finishing of the shoulders.

The width of the trench shall be approximately 300 mm (12 in.) unless otherwise directed. Other dimensions shall be as shown on the plans.

After the trench has been prepared, it shall be backfilled to the required elevation with aggregate, and then be well compacted. After this, any remaining unfilled trench area shall be filled with material approved for shoulders and compacted by rolling or tamping or both. The finished shoulder elevation shall conform with that required at that point.

608.04 Method of Measurement. Shoulder drains will be measured by the megagram (ton) of aggregate placed.

608.05 Basis of Payment. The accepted quantities of aggregate for shoulder drains will be paid for at the contract unit price per megagram (ton) for aggregate for shoulder drains complete in place.

Payment will be made under:

Pay Item	Metric Pay Unit Symbol (English Pay Unit Symbol)
Aggregate for Shoulder Drains	Mg (TON)

Excavation, trenching, backfilling, and other related miscellaneous items will not be paid for separately, but the cost thereof shall be included in the cost of the pay item.

SECTION 609 -- Blank

SECTION 610 -- SURFACES FOR APPROACHES

610.01 Description. This work shall consist of constructing cement concrete bridge approaches and surfacing or resurfacing the area from the edge of the main line surface to the right-of-way line at public road intersections; turn lanes, passing lanes, acceleration lanes, deceleration lanes, or recovery lanes between the edge of the main line surface and the right-of-way line, of which the total longitudinal dimension is less than 30 m (100 lft), excluding tapers; over the area of rural mail box approaches; from the edge of the mainline surface to a width of 1 m (36 in.) on private and commercial driveways; over the area of public road and private and commercial driveway crossovers; and other locations as specified in accordance with 105.03.

MATERIALS

610.02 Materials. Materials shall be in accordance with 402, 500, or 700, whichever is applicable. HMA for approaches may be that specified for mainline or HMA base, intermediate, or surface. Mixture adjustments in accordance with 904.02(a) will not apply to approaches.

CONSTRUCTION REQUIREMENTS

610.03 General Requirements. Except as otherwise herein provided, subgrade for approaches shall be prepared in accordance with 207.04.

For open graded base mixtures, a cover aggregate, or choke, will be required for which the gradation of shall be 100 percent passing the 12.5 mm (1/2 in.) sieve and 0 to 10 percent passing the 75 Φm (No. 200) sieve.

Forms, unless otherwise provided, shall be used for laying paving mixtures. They may be of wood or metal and shall be of sufficient strength to resist springing and firmly held true to line and grade during depositing and compacting the material. They shall be cleaned and oiled each time before material is placed against them.

When placing HMA mixtures, a mechanical paver will not be required unless specified. Approved hand methods may be used.

The course or courses shall be compacted with either a three wheel roller or a tandem roller in accordance with 408.03(d). Areas inaccessible to the roller equipment shall be thoroughly compacted with mechanical tamps, vibrators, or other approved compacting methods.

If approved, plain cement concrete pavement may be substituted where the mixture for approaches as described in 610.02 has been specified. The approach shall be constructed in accordance with applicable provisions of 610.05 except joints will not be required unless designated. For such substitution, measurement shall be in accordance with 610.06 and payment made at the contract unit price for HMA mixture for approaches.

610.04 Existing Approaches and Crossovers. If an existing asphalt surface is to be left in place as an approach pavement or crossover, and if directed, such surface shall be patched in accordance with 305.05.

Other corrections to existing approaches shall include all necessary excavation and shaping or leveling of material in place, the application of asphalt material for prime or tack coats, and the placing of HMA mixtures.

610.05 Cement Concrete Bridge Approach Pavement. Cement concrete bridge approach pavement shall be either reinforced or plain as specified, and constructed as pavement on approaches to bridges when such approaches are a part of the bridge contract. It may be constructed by either machine or hand methods. Regardless of the method of construction, the pavement will be cored as miscellaneous pavement. The pavement thickness and location of reinforcing steel will be measured. All variations will be administered in accordance with 501.24.

(a) Machine Method. The pavement may be constructed in accordance with 501, including composition of concrete, except construction of the pavement in traffic lane widths will be permitted provided an approved, power driven, tandem screed, finishing machine is used. Forms and joints shall be in accordance with the requirements set out for hand methods.

(b) Hand Method. The concrete shall be class A in accordance with 702. If mixed at the site, it may be transported from the mixer to the subgrade by any satisfactory means. The pavement shall be poured in a minimum width of one traffic lane, and a maximum width of 7.3 m (24 ft). Screeds shall be, as a minimum, the full width of the pour. Forms shall be of metal with no less than a base width of 150 mm (6 in.). The forms shall be drilled or slotted to provide for placement of dowel bars. The longitudinal keyway construction joint shall be in accordance with 501.14(b). A drag template or strike-off shall be used to ensure accurate placing of the mesh. Finishing shall be in accordance with applicable provisions of 501.15 except the use of the vibrator on the strike-off template shall be provided during the first pass and as directed on subsequent passes.

Mixing and placing capacity and amount of forms required shall be no less than shown in the following table:

Total pavement at structure m5 (sq yd)	Minimum mixing and placing capacity, m/h (lft/hr) 3.6 m (12 ft) width	*Minimum length of usable forms, m (LFT)
0.84-2090 (1-2,500)	7 (25)	120 (400)
2091-4180 (2,501-5,000)	11.0 (37.5)	180 (600)
4181-6270 (5,001-7,500)	15.0 (50)	240 (800)
6271-8360 (7,501-10,000)	19.0 (62.5)	300 (1,000)
8361-upward (10,001-upward)	22.9 (75)	370 (1,200)

* May be reduced to 2 times the length of maximum continuous length of pavement to be poured if less than amount shown in table.

610.06 Method of Measurement. HMA mixtures and compacted aggregate will be measured by the megagram (ton). Cement concrete approach pavement will be measured by the square meter (square yard) in accordance with 501.25. Plain cement concrete pavement substituted for HMA mixture for approaches will be measured in accordance with 610.07. Reinforcing steel will be measured in accordance with 703.07.

Prime coat will be measured in accordance with 405.09. Tack coat will be measured in accordance with 406.06. Seal coat will be measured in accordance with 404.09.

610.07 Basis of Payment. The accepted quantities of HMA mixture for approaches, turn lanes, passing lanes, acceleration lanes, deceleration lanes, recovery lanes, driveways, or mailbox approaches will be paid for at the contract unit price per megagram (ton) for HMA approaches. Compacted aggregate will be paid for at the contract unit price per megagram (ton). Cement concrete bridge approach pavement will be paid for at the contract unit price per square meter (square yard). Reinforcing steel will be paid for at the contract unit price per kilogram (pound).

Prime coat will be paid for in accordance with 405.10. Tack coat will be paid for in accordance with 406.07. Seal coat will be paid for in accordance with 404.10.

Payment will be made under:

Pay Item	**Metric Pay Unit Symbol (English Pay Unit Symbol)**
Metric Pay Item (English Pay Item	**Metric Pay Unit Symbol English Pay Unit Symbol)**
Cement Concrete Pavement, _____, _____ mm (type, thickness)	..... m2
(Cement Concrete Pavement, _____, _____ in.)	.....SYS)

type thickness

Compacted Aggregate. _____.....Mg (TON)

type

HMA for Approaches.....Mg (TON)

Reinforcing Steel..... kg (LBS)

The costs of excavation, compaction, cover aggregate used as choke, and all necessary incidentals shall be included in the costs of the pay items.

If the 1 m (36 in.) wedge is placed on approaches at the same time and in conjunction with the mainline HMA base, intermediate, or surface, payment will be made at the same unit price as for the material placed on the mainline.

If plain cement concrete is substituted for HMA mixture for approaches, the thickness shall be as specified. However, its thickness shall not be less than 150 mm (6 in.) for public road approaches, nor less than 125 mm (5 in.) for other approaches or crossovers if built in accordance with the requirements herein. The pavement volume will be computed in cubic meters (cubic yards) and multiplied by a mass (weight) in megagrams (tons) which is two times the ratio between the designated HMA pavement thickness in millimeters (inches) and the substituted concrete pavement thickness in millimeters (inches). The masses (weights) so determined will be paid for as HMA for approaches.

SECTION 611 -- CROSSOVERS, DRIVEWAYS AND MAILBOX INSTALLATIONS

611.01 Description. This work shall consist of the construction of permanent crossovers, private or commercial driveways, mailbox installations, or it shall consist of the placement, maintenance, removal, closure, or refurbishing of temporary crossovers in accordance with these specifications and in reasonably close conformance with the lines, grades, and details shown on the plans or as directed.

MATERIALS

611.02 Materials. Materials for crossover, driveway, and mailbox pavements shall be in accordance with the applicable requirements of 402 or 501 as applicable. HMA mixtures shall consist of HMA base, intermediate, or surface. Other materials shall be in accordance with the following:

Mailbox Support Galvanized Hardware	ASTM A 153
Nominal Standard Galvanized Pipe	ASTM A 120
Permanent Traffic Markings	808
Traffic Control Devices	801
Treated Wood Posts	911.02(e)

CONSTRUCTION REQUIREMENTS

611.03 General Requirements. Except as otherwise provided, all applicable provisions of the section under which the mixture being used for paving the specified area is made shall apply. Subgrade shall be prepared in accordance with 207.04. The course or courses shall be compacted with either a three wheel or a tandem roller in accordance with 408.03(d).

611.04 Temporary Crossovers. Temporary crossovers shall be either type A or type B as shown on the plans and as specified herein.

The pavement structure for the temporary crossover shall be as shown on the plans.

Traffic control devices, including temporary pavement markings, shall be as shown on the plans. Separation of opposing vehicular traffic between two crossovers shall be as shown on the plans.

Refurbishing of a temporary crossover shall consist of the removal of drums or earth cover from an existing temporary crossover. The temporary crossover shall be patched and resurfaced as directed. Excavated soil resulting from the refurbishing operation, if not used as a part of the contract work, shall become the property of the Contractor. Removed drums will remain the property of the Department.

After construction is complete, and prior to the opening of all lanes to traffic, the temporary crossover shall be removed or closed.

Where guardrail is required to be removed for construction or refurbishing of crossovers, such removal and subsequent re-erection shall be done as shown on the plans or as directed.

611.05 Mailbox Assembly. Existing mailboxes and assemblies shall be carefully removed without damage from the highway right-of-way. Mailboxes, which must remain in service between removal and erection of the new assembly, shall be securely mounted to an empty 210 L (55 gal.) metal drum. The temporary assembly shall be located where it is accessible for mail delivery but placed as far as possible from the traveled roadway. The apparent owner of the existing mailbox shall be contacted and allowed to take possession of the existing mailbox and assembly. If the owner refuses to take possession, the existing mailbox and assemblies shall be removed.

Mailbox assemblies shall be furnished and installed as shown on the plans. Alternate mailbox assemblies which have been crash tested and approved in accordance with FHWA requirements may be considered upon receipt of a written request. Alternate mailbox assemblies approved for use shall be furnished and installed in conformance with the manufacturer's recommendations.

Mailboxes complying with the requirements of the United States Postal Service, including markings and sizes, shall be furnished and installed with the mailbox assembly. The mailbox shall be of comparable size to the existing mailbox previously removed from the highway right-of-way. The markings shall include "approved by U.S. Postmaster" stamped on the mailbox by the manufacturer and the address number, box number, or house number, in 50 mm (2 in.) or larger reflective material placed on the side of the mailbox in view of motorists in the nearest travel lane.

611.06 Method of Measurement. Cement concrete pavement will be measured by the square meter (square yard), including all curb which is not a pay item. Compacted aggregate will be measured by the megagram (ton). Preformed joint material, if specified as a pay item, will be measured by the meter (linear foot). Mailbox assemblies will be measured by the number of units installed. Temporary crossovers type A and type B will be measured per each crossover. The refurbishing of temporary crossovers will be measured per each type of crossover refurbished. Drainage pipe will be measured in accordance with 715.11. Seeding and sodding will be measured in accordance with 621.12. Flashing arrow signs, type III-B barricades, road closure sign assemblies, temporary pavement markings and temporary raised pavement markers, if specified, will be measured in accordance with 801.17. Permanent pavement markings and snowplowable raised pavement markers will be measured in accordance with 808.11. Removal of existing conflicting pavement markings, messages, and raised pavement markers will be measured in accordance with 808.11. Resurfacing will be measured in accordance with 610.06. Patching will be measured in accordance with 620.07. HMA mixtures will be measured by the megagram (ton) in accordance with 109.01(b).

611.07 Basis of Payment. The accepted quantities of cement concrete pavement will be paid for at the contract unit price per square meter (square yard) for the use specified. Compacted aggregate will be paid for at the contract unit price per megagram (ton) for the type specified. HMA mixture will be paid for at the contract unit price per megagram (ton) for the specified type of material. Preformed joint material, when specified as a pay item, will be paid for at the contract unit price per meter (linear foot), complete in place. The

accepted quantities of temporary crossovers will be paid for at the contract unit price per each for the type specified. The accepted quantity of refurbishing existing temporary crossovers will be paid for at the contract unit price per each for the type specified. HMA mixtures required for temporary crossovers will be paid for as HMA for approaches, complete in place in accordance with 610.07.

The accepted quantities for pavement placed for mailbox approaches will be included with quantities required to construct the shoulder section, when the shoulder is paved. If the shoulder is unpaved, the pavement placed for mailbox approaches will be paid for as HMA mixture for approaches and compacted aggregate base. Mailbox assemblies will be paid for at the contract unit price for each, complete in place.

Flashing arrow signs required for use with temporary crossovers will be paid for in accordance with 801.18.

Traffic control devices which are specified as pay items will be paid for in accordance with 801.18.

Temporary pavement markings and temporary raised pavement markers, if specified, will be paid for in accordance with 801.18. Removing existing conflicting pavement markings and raised pavement markers, the placement of permanent pavement markings, and snowplowable raised pavement markers will be paid for in accordance with 808.12.

Resetting of guardrail, if required, will be paid for accordance with 601.13. Drainage pipe, when required, will be paid for in accordance with 715.12. Seeding and sodding will be paid for in accordance with 621.13.

Payment will be made under:

Pay Item	**Metric Pay Unit Symbol (English Pay Unit Symbol)**
Cement Concrete Pavement for _____	m2 (SYS)
Compacted Aggregate, _____ type	Mg (TON)
HMA for _____ mixture	Mg (TON)
Mailbox Assembly, Double	EACH
Mailbox Assembly, Single	EACH
Preformed Joint Material	m (LFT)
Temporary Crossover, _____ type	EACH
Temporary Crossover, _____, Refurbish type	EACH

The cost of wood or pipe posts, support hardware, mailbox, and removal of existing mailbox and its assembly shall be included in the cost of the mailbox assembly.

The costs of installation, maintenance, and removal or closure of the temporary crossover, including excavation, compaction, subgrade preparation, and reshaping damaged median area shall be included in the cost of temporary crossover.

The costs of removal of earth cover, removal of drums, reshaping damaged median areas, and closure or removal of temporary crossover shall be included in the cost of temporary crossover, refurbish.

The costs of excavation, compaction, subgrade preparation, preformed joint material when not specified as a pay item, and all necessary incidentals shall be included in the costs of other pay items.

SECTION 612 -- UNDERSEALING

612.01 Description. This work shall consist of furnishing and pumping an asphalt material under cement concrete pavement in accordance with 105.03.

MATERIALS

612.02 Materials. Utility asphalt, UA-II or UA-III shall be in accordance with 902.02(d).

CONSTRUCTION REQUIREMENTS

612.03 Shoulders. All holes, low areas, or displaced areas in the shoulders immediately adjacent to the pavement edge shall be filled with loam, clay, or other approved material and compacted to the elevation of the pavement. Such areas, including all other shoulder areas immediately adjacent to the pavement edge, shall be compacted with a roller or another approved method.

612.04 Drilled Holes. Where the existing pavement has transverse joints, holes not to exceed 38 mm (1.5 in.) in diameter shall be drilled on the centerlines of the pavement lane to be treated. Such holes, unless otherwise directed, shall be located longitudinally between transverse joints or cracks at approximately 750 to 900 mm (30 to 36 in.) from the joints or cracks. Intermediate holes, if necessary, shall be spaced as directed.

If the existing pavement does not have transverse joints, holes not to exceed 38 mm (1.5 in.) in diameter shall, unless otherwise permitted or directed, be located on the centerline of the pavement lane to be treated and be spaced as directed.

An approved method shall be used to prevent the drill from entering the subgrade after penetrating the pavement. Automatic stops on mechanical equipment and marked drill bits on hand-operated jackhammers may be approved subject to satisfactory operation.

Just prior to pumping operations, the surface of the pavement around each hole for an area of at least 1/2 the width of the lane being treated shall be thoroughly sprinkled with water to prevent the undersealing material from adhering to the pavement surface.

612.05 Pumping Asphalt. After the above procedure is complete, the asphalt shall then be pumped through the holes and under the pavement with an approved type of

self-propelled pressure distributor, the pressure to be as directed. A metallic hose shall connect the asphalt tank through an asphalt pump to a 25 mm (1 in.) nozzle and a return metallic hose shall connect the nozzle to the asphalt distributor tank.

The nozzle shall be equipped with a three way valve so designed that the asphalt may circulate back to the distributor tank when pumping operations are not in progress. The nozzle shall be inserted in the hole, driven to a snug fit, and pumping of the asphalt continued until the undersealing is complete, or to such other amount as directed. In case of an existing asphalt resurface on concrete, holes shall be drilled through the resurface and the underlying concrete and the nozzle shall be of sufficient length that it can be driven to a snug fit into the concrete without the upper part of the nozzle being below the elevation of the existing asphalt resurface. Upon completion of the pumping operation, the nozzle shall be removed and a wood plug driven into the hole without an excessive back flow of asphalt. material. After the material has hardened, the plug shall be removed and a hardwood plug at least 75 mm (3 in.) long and a minimum of 2 mm (1/16 in.) larger than the diameter of the drilled hole shall be driven flush with the surface of the concrete pavement. All material extruded during the pumping operations shall be immediately cleaned from the pavement surface and removed from the limits of the contract within a period of 24 h.

Where undersealing operations are being performed under traffic, necessary signs, barricades, watchers, and flaggers shall be used to maintain one lane traffic in the immediate vicinity of pumping operations. Traffic may be permitted to use the pumped areas upon removal of the original plugs and after the hardwood plugs are driven.

All storage tanks, pipes, retorts, booster tanks, and distributors used for storing or handling the asphalt materials shall be kept clean and in good operating condition at all times so there is no contamination of the materials.

The asphalt shall not be heated above 260EC (500EF) at any time and, when pumped under the pavement, the temperature shall be no less than 177EC (350EF). All material heated beyond 260EC (500EF) shall be rejected.

No material shall be applied on a frozen subgrade nor when the atmospheric temperature is 4EC (40EF) or lower and falling. The asphalt shall be placed only when general weather conditions are suitable.

When directed, certain portions may be required to be undersealed a second time. The number of holes involved in this second undersealing shall not exceed five percent of the number of holes indicated in the Schedule of Pay Items.

612.06 Method of Measurement. Asphalt material will be measured by the megagram (ton). Drilled holes will be measured per each hole drilled.

612.07 Basis of Payment. This work will be paid for at the contract unit price per megagram (ton) for asphalt material for underseal. Drilled hole for underseal will be paid for at the contract unit price per each, complete in place.

Additional holes and materials required for a second undersealing operation will be paid for at the contract unit prices for the quantities involved.

Payment will be made under:

Pay Item	Metric Pay Unit Symbol (English Pay Unit Symbol)
Asphalt Material for Underseal	Mg (TON)
Drilled Hole for Underseal	EACH

The costs of shoulder material, wood and hardwood plugs, and necessary incidentals shall be included in the costs of the pay items.

SECTION 613 -- SALVAGED ROAD MATERIALS

613.01 Description. This work shall consist of removing approved material from an existing road within the limits of the contract, including intersecting approaches, and using it in reconstruction of the road in accordance with these specifications or as directed.

613.02 Materials. Approved materials may be asphalt treated or untreated gravel, stone, slag, or all combination of these or other materials which are suitable for salvaging.

613.03 Construction Requirements. Before any filling or further work is done at locations where material is to be salvaged, such material shall be removed and stored in stockpiles outside the construction limits and adjacent thereto, or it may be incorporated directly into the work without stockpiling if conditions permit.

The quantities removed, if available, shall be sufficient to complete the item of work or certain portions thereof for which it is intended. The depth of excavation shall be as directed.

The incorporation of the salvaged material into the work shall be in accordance with applicable provisions of the specifications for which the material is to be used or in accordance with the special provisions, depending on the nature of the material and the use to which it is put.

613.04 Method of Measurement. Salvaged road material will be measured by the cubic meter (cubic yard) in stockpiles after removal from its original position or, if the Contractor prefers, it will be measured by the cubic meter (cubic yard) in its original position. All measurements will be made by means of cross sections. The volumes will be computed by the average end area method.

If salvaged road material is used as subbase, the combined pay quantities of subbase and salvaged road material for subbase shall equal but shall not exceed the total theoretical volume as calculated to the neat lines shown on the plans for subbase. If the volume of salvaged road material used as subbase determined by the cross section method does exceed the total theoretical volume of subbase, the final pay quantity for salvaged road material for subbase shall be the total theoretical volume.

The final pay quantity of subbase will be determined by deducting the final pay quantity of salvaged road material for subbase from the total theoretical volume of subbase.

If salvaged road material is obtained from within the pay limits of the new construction, such cubic meterage (cubic yardage) of salvaged material will be deducted from the excavation quantities to be measured for payment.

613.05 Basis of Payment. The accepted quantities of salvaged road material for the use shown in the Schedule of Pay Items will be paid for at the contract unit price per cubic meter (cubic yard), complete in place.

Payment will be made under:

Pay Item	Metric Pay Unit Symbol (English Pay Unit Symbol)
Salvaged Road Material for _____	m3 (CYS)

The costs of removal of the material, storage, incorporating it into the work, and necessary incidentals shall be included in the cost of the pay item.

SECTION 614 -- CONCRETE HEADER

614.01 Description. This work shall consist of the construction or reconstruction of portland cement concrete headers adjacent to railroad tracks, bridges, and similar locations in accordance with these specifications and in reasonably close conformance with the lines, grades, and details shown on the plans or as directed.

MATERIALS

614.02 Materials. Materials shall be in accordance with the following:

Concrete	501
Steel	910

If the header is adjacent to cement concrete base or pavement, the header concrete shall be the same composition as that of the base or pavement header constructed monolithic with the base or pavement. If the adjacent base or pavement is thickened, that portion forming the thickening shall be considered as part of the header.

If the header is adjacent to asphalt pavement, the concrete may be proportioned in accordance with 501.03, or it may be class A in accordance with 702 using class AP coarse aggregate.

CONSTRUCTION REQUIREMENTS

614.03 Cement Concrete Header. Construction shall be in accordance with the applicable provisions of 501 and with these requirements.

Welding shall be in accordance with 711.32.

If the header is adjacent to cement concrete base or pavement, the header concrete shall be the same composition as that of the base or pavement header constructed monolithic

with the base or pavement. If the adjacent base or pavement is thickened, that portion forming the thickening shall be considered as part of the header.

If the header is adjacent to flexible type pavement, the concrete may be proportioned in accordance with 501.03, or it may be class A in accordance with 702.

Headers at railroad crossings shall be as shown on the plans.

614.04 Reconstructed Cement Concrete Header. This work shall be in accordance with the plans. Round plug welds or rectangular shaped plug welds may be used to weld the steel angle to the existing steel edge protection. Round plug welds shall be a minimum of 25 mm (1 in.) diameter.

Welding shall be in accordance with 711.32.

614.05 Method of Measurement. Cement concrete header and reconstructed cement concrete header will be measured by the meter (linear foot).

614.06 Basis of Payment. The accepted quantities of this work will be paid for at the contract unit price per meter (linear foot) for header, cement concrete, of the type specified, or header, cement concrete, reconstruct, complete in place.

Payment will be made under:

Pay Item	Metric Pay Unit Symbol (English Pay Unit Symbol)
Header, Cement Concrete, _____ type	m (LFT)
Header, Cement Concrete, Reconstruct	m (LFT)

The costs of edge protection, metal chairs, excavation, and necessary incidentals shall be included in the costs of the pay items.

SECTION 615 -- MONUMENTS, MARKERS AND PARKING BARRIERS

615.01 Description. This work shall consist of furnishing and setting, setting only, or resetting right-of-way markers, monuments for marking section or other lines, bench-mark posts and tablets, and parking barriers in accordance with these specifications and in reasonably close conformance with details shown on the plans or as directed.

MATERIALS

615.02 Materials. Materials shall be in accordance with the following:

Coarse Aggregate, Class A, Size No. 5, No. 8, or No. 91	904.02
Fine Aggregate, Size No. 23	904.01
Portland Cement	901.01(b)
Reinforcing Steel	910.01

615.03 Reinforced Cement Concrete Right-of-Way Markers. These markers shall conform with the dimensions and lettering shown on the plans. The reinforcement shall be securely held in place by at least 4 spacers of an approved design. The concrete ingredients shall be graded and proportioned to produce a strong dense concrete.

When tested as hereinafter described, a specimen shall support a total load of at least 10700 N (2,400 lb) before the first crack appears. The specimen will be tested as a simple beam. The distance between supports shall be exactly 600 mm (24 in.) with the load applied at the rate of approximately 5400 N (1200 lb) per minute in the center of the span. Loading will continue until the first crack appears.

The cement concrete shall absorb no more than 8 percent water. Specimens for absorption may be taken from the markers tested for strength. The absorption test shall be as described in AASHTO T 280 except the specimen tested shall be the full cross section marker.

The markers shall have a smooth workmanlike finish free from cracks, patches, honeycomb, exposed reinforcement, and excessive bubble holes. Each marker shall be plainly marked near the bottom with the trademark or initials of the manufacturer and the date of manufacture. These letters and figures shall be no less than 25 mm (1 in.) in height and shall be indented 3 mm (1/8 in.).

Right-of-way markers furnished under this specification shall be covered by a type C certification in accordance with 916.

615.04 Monuments. Monuments shall be of the type specified in the Proposal book, the details of which are shown on the plans. Any portion extending above the ground shall be finished in accordance with 702.20.

Where concrete is required, it shall be class A in accordance with 702. When placed in the forms it shall be tamped in layers until mortar covers the outer surface. The tops of the monuments shall be floated smooth. Monuments may be cast in place or cast outside and then set.

The pin shall be set perpendicular to and flush with the top of the monument while the concrete is plastic and left undisturbed until the concrete has set. The pin shall be copper and shall be 25 mm (1 in.) in diameter and 130 mm (5 in.) long. If for type D monuments, the hole shall be drilled in the center with a 3 mm (1/8 in.) drill for a depth of 38 mm (1.5 in.). The hole shall be filled with lead flush with the end of the pin. Castings for protected monuments shall be in accordance with 910.05(a).

615.05 Bench Mark Posts. Bench mark posts shall be of the dimensions shown on the plans and cast in accordance with applicable provisions of 615.03, except the strength shall be determined by concrete cores taken from the finished product. At least two concrete cores will be taken from each unit and the average strength of the unit shall be at least 28 MPa (4000 psi) with no individual core strength less than 25 MPa (3600 psi). Tablets will be furnished by the Department and shall be set in the posts as indicated on the plans.

615.06 Parking Barriers. Parking barriers shall be of the dimensions shown on the plans. The barriers shall be cast and tested in accordance with the applicable requirements of 615.03, except the strength shall be determined by concrete cores taken from the finished product. At least two concrete cores will be taken from each unit and the average strength of the unit shall be at least 28 MPa (4000 psi) with no individual core strength less than 25 MPa (3600 psi).

CONSTRUCTION REQUIREMENTS

615.07 Setting Right-of-Way Markers. The back face of these markers shall be set on right-of-way lines approximately 300 m (1,000 ft) apart as hereinafter provided. They shall be set at all corners of irregular right-of-way lines, opposite each P.C. and P.T. of curves, and not to exceed 150 m (500 ft) apart on the inside and outside of curves. Care shall be used in locating markers on tangents so that a marker is plainly visible from each of those adjacent.

Markers shall be set plumb, to the depth required on the plans, and with the letters facing the pavement. Portions of the holes not occupied by markers shall be backfilled and compacted in layers with suitable material up to the level of the original ground. The markers shall not be displaced during backfilling.

615.08 Resetting Right-of-Way Markers. When the proposal provides that existing right-of-way markers be reset, the existing markers shall be removed and reset at designated locations in accordance with 615.07.

615.09 Setting Monuments. If the location of a monument falls within the limits of a cement concrete pavement, a copper pin, the details of which are shown on the plans, shall be set perpendicular to and flush with the top of the finished pavement. It shall be placed just before the concrete takes initial set and then left undisturbed until the concrete has set. Other monuments shall be of the type shown on the plans, depending on the type or surface of the pavement in which they are to be placed or if they are to be placed outside the pavement. Necessary excavation shall be to the required depth. The bottom of the excavation shall be firm and true to line and grades given. After a monument is in place, the remaining excavated areas shall be backfilled with suitable material firmly tamped in layers. The monument shall not be disturbed.

Existing monuments which are not required to be disturbed or re-established, but which are disturbed during construction operations, shall be re-established.

615.10 Re-Established Monuments. It may be necessary to re-establish existing monuments in pavements or bases which are disturbed unavoidably or covered by operations embraced in the contract.

If the existing monument is, or contains a brass or copper pin, the pin shall be extended to the surface of the new pavement by attaching a brass or copper pin with at least a 25 mm (1 in.) diameter and of the length required. Such extensions shall be attached by tapping the original pin and providing a necessary screw attachment such that the extension can be fastened securely to the original pin. The tapped hole shall be at least 6 mm (0.25 in.) in diameter and no less than 25 mm (1 in.) deep . The screw attachment shall have the same

diameter as that for the hole in the original pin and shall be no less than 25 mm (1 in.) in length.

Where an existing monument of the type specified above has not been re-established on a previous contract, the monument shall be re-established in the same manner as set out above.

Where existing monuments are protected and encased in cast iron, such castings shall be adjusted to meet the elevation of the proposed surface by means of an asphalt coated, cast iron, adjustment casting. The size shall be the same as the original casting and of the depth necessary to meet the elevation of the proposed new surface.

615.11 Setting Bench Mark Posts and Tablets. Bench mark posts shall be set at locations indicated on the plans or as directed. Excavation shall be to the depth indicated and to dimensions sufficient to provide for the concrete backfilling. This concrete shall be class A and shall extend for 150 mm (6 in.) around and below the post. The bottom shall be monolithic with the sides. The remainder of the excavation up to the original ground line shall be backfilled with suitable material well tamped in layers. Care shall be taken not to disturb the post. When specified on the plans, or directed, bench mark tablets furnished by the Department shall be placed in newly constructed or existing drainage structures located within the limits of the contracts.

615.12 Reset Bench Mark Posts. When the Proposal book provides that existing bench mark posts be reset, the existing bench mark posts shall be removed and reset at designated locations in accordance with 615.11.

615.13 Method of Measurement. Right-of-way markers, reset right-of-way markers, monuments, re-established monuments, castings adjusted to grade monuments, bench mark posts, and reset bench mark posts will be measured by the number of units installed. Parking barriers will be measured by the number of units installed.

615.14 Basis of Payment. The accepted quantities of right-of-way markers, reset right-of-way markers, monuments, reestablished monuments, castings adjusted to grade monuments, bench mark posts, reset bench mark posts, and parking barriers will be paid for at the contract unit price per each complete in place.

Payment will be made under:

Pay Item	Pay Unit
Bench Mark Post	EACH
Bench Mark Post, Reset	EACH
Casting Adjusted to Grade, Monument	EACH
Monument, _____ type	EACH
Monument, Re-establish	EACH
Parking Barrier	EACH
Right-of-Way Marker	EACH
Right-of-Way Marker, Reset	EACH

The costs of setting tablets in structures or bench mark posts, extensions for monuments, adjustment castings, re-establishing disturbed existing monuments, and other necessary incidentals shall be included in the costs of the pay items.

SECTION 616 -- RIPRAP AND SLOPEWALL

616.01 Description. This work shall consist of placing broken stone or concrete which may or may not be grouted, precast slabs, or slopewall in accordance with these specifications and in accordance with 105.03.

MATERIALS

616.02 Materials. Materials shall be in accordance with the following:

Asphalt Joint Filler	906.01
Clay	903.01
Concrete, Class A	702
Geotextile	913.18
Riprap	904.04
Welded Steel Wire Fabric	910.01(b)5

Welded wire fabric shall be 150 mm by 150 mm (6 in. by 6 in.) mesh, W-3 x W-3 wires, with a mass per square area of 205 kg/100 m^2 (42 lb/100 ft^2).

CONSTRUCTION REQUIREMENTS

616.03 Placing Dumped Riprap. Dumped riprap shall be placed to produce a surface of approximate regularity but need not necessarily be hand placed. The finished surface shall vary no more than 230 mm (9 in.) from a true plane. The thickness perpendicular to its surface shall be no more than 0.6 m (2 ft) nor less than 0.3 m (1 ft) unless otherwise directed.

616.04 Placing Revetment, Class 1, and Class 2 Riprap. Revetment, class 1 and class 2 riprap may be placed by dumping and shall be placed to the required thickness. The finished surface shall be free from clusters of small stones or of large ones. The finished surface shall vary from a true plane no more than 230 mm (9 in.) for revetment riprap or 450 mm (18 in.) for class 1 or class 2 riprap but shall not be less than the minimum depth specified.

616.05 Placing Uniform Riprap. Uniform riprap shall be placed to produce a surface of approximate regularity with edges having projections no more than 100 mm (4 in.) above the required cross section. The material shall be hand laid or placed by other approved means.

616.06 Blank.

616.07 Placing Grouted Riprap. The aggregate, preparation of the slope, and the depth of riprap aggregate for grouted riprap shall be in accordance with 616.04. After the aggregate has been placed and accepted, all openings shall be filled with cement grout. The finished surface shall be approximately smooth, solid, and true to line, grade, and section.

616.08 Placing Precast Cement Concrete Riprap. The slope on which the riprap is to be placed shall be in accordance with that shown on the plans unless otherwise designated. Laying shall begin in a trench below the toe of the slope and progress upward. Each piece shall be laid by hand perpendicular to the slope. It shall be firmly embedded against the slope in such a manner that the vertical joint space between individual units does not exceed 10 mm (3/8 in.), unless otherwise permitted. Half blocks, odd shaped blocks, or class A concrete shall be used to fill the voids at the ends of sections to be placed or on curved shaped sections. The top course shall conform, as nearly as practicable, with the prescribed berm or shoulder elevation. Any adjustment necessary to achieve this shall be obtained by constructing a wedge course near the top of the slope as directed. This wedge course, when required, shall consist of class A concrete except when the thickness of the course does not permit, it shall be constructed of a 1:2 mortar proportioned by volume. Toewalls, when required, shall consist of class A concrete.

616.09 Slopewall. The slope on which slopewall is to be placed shall be in accordance with that shown on the plans unless a different slope is designated.

The concrete mixture shall be class A. Where paved slopewall abuts or surrounds columns, piers, or other structures, 15 mm (5/8 in.) of asphalt joint filler shall be used between the slopewall and such structure. Welded steel wire fabric shall be placed within the middle third of the slopewall thickness unless otherwise directed. The fabric shall extend through all construction joints. The surface of the slopewall shall be cured for 48 h in accordance with 501.17. Construction joints may be either butt or keyway type.

Inspection holes shall be provided at the locations shown on the plans or as directed. The holes shall be approximately 1 m x 1 m (3 ft x 3 ft) in size.

Precast concrete riprap, type B, as shown on the plans, may be used in lieu of slopewall of 100 mm (4 in.) thickness.

616.09.1 Undermined Paved Side Ditch. Treatment of undermined existing paved side ditch and placement of revetment riprap shall be as shown on the plans or as otherwise directed.

Undermined paved side ditch shall be broken up and left in place. If it is determined that erosion is excessive, the eroded area shall be backfilled with a cohesive material, compacted, regraded, and lined with revetment or uniform riprap.

616.10 Installation of Geotextile Under Riprap. Storage and handling of geotextiles shall be in accordance with the manufacturer's recommendations, except that the geotextile shall not be exposed to direct sunlight, ultraviolet rays, water, temperature greater than 60EC (140EF), mud, dirt, dust, and debris, to the extent that its strength, toughness or permeability requirements are diminished. Each geotextile roll shall be labeled or tagged to provide product identification sufficient for inventory and quality control purposes. Exposure of geotextiles to the elements between lay down and cover shall be a maximum of 14 days. At the time of installation, the geotextile shall be rejected and replaced with no additional payment if defects, rips, flaws, deterioration or damage incurred during manufacture, transportation, storage or construction is evident.

The surface to receive the geotextile shall be prepared to a relatively smooth condition free of obstructions, depressions and debris within the limits indicated on the plans.

Geotextiles used along channels shall be placed with the machine direction of the geotextile parallel to the channel. Successive geotextile sheets shall be overlapped in such a manner that the upstream sheet is placed over the downstream sheet and the upslope sheet over downslope sheet.

Geotextiles used for 2:1 slopes or greater shall be placed with the machine direction of the geotextile sheets perpendicular to the toe of slope. The geotextile sheets shall be overlapped in the direction of the anticipated movement of the water.

Adjacent pieces of geotextile may be joined by sewing if approved, or by overlapping and pinning. The minimum overlap shall be 460 mm (18 in.) except when placed under water. When placed under water the overlap shall be a minimum of one meter (3 ft). Securing pins shall be steel, 5 mm (3/16 in.) in diameter, 460 mm (18 in.) long, pointed at one end and fabricated with a head to retain a steel washer having an outside diameter of no less than 38 mm (1.5 in.). Securing pins with washers shall be inserted through both strips of overlapped geotextile at spacing intervals in Table 1 along a line through the midpoint of the overlap. The geotextile strip shall be placed so that the lower strip will be overlapped by the next higher strip. Pins shall be driven until the washer bears against the geotextile and secures it firmly to the ground.

Whether the fabric is joined by sewing or pinning, additional pins shall be installed as necessary to prevent any slippage of the fabric regardless of location.

TABLE 1

Slope	Pin Spacing
steeper than 3:1	0.5 m (2 ft)
3:1 to 4:1	1.0 m (3 ft)
4:1 or flatter	1.5 m (5 ft)

The geotextile shall be placed in such a manner that placement of the overlying materials will not excessively stretch or tear the geotextile and will not pull the required overlap or seam apart. Construction equipment will not be allowed on the exposed geotextile. Placement of riprap or stone shall start from the base of the slope, moving upslope and from the center outward. Riprap shall not be allowed to roll downslope and the height drop for riprap shall be kept to less than 0.6 m (2 ft).

616.11 Method of Measurement. Dumped, revetment, class 1, and class 2 riprap obtained from outside the right-of-way will be measured by the megagram (ton). If obtained from inside the right-of-way, no measurement will be made if placed as shown on the plans unless direct payment is specified. If placed at locations not shown on the plans, measurement will be made by the square meter (square yard).

Grouted riprap, and precast concrete riprap, including the area occupied by the wedge course, will be measured by the square meter (square yard), parallel to the slope. Slopewall will be measured by the square meter (square yard). Holes for inspecting slopewalls will be measured per each. Geotextiles used under riprap will be measured by the square meter (square yard), complete in place. Uniform riprap will be measured by the megagram (ton).

Treatment of undermined paved side ditch will be measured by the meter (linear foot) of paved side ditch, broken and left in place.

616.12 Basis of Payment. The accepted quantities of dumped, revetment, class 1, and class 2 riprap obtained from outside the right-of-way will be paid for at the contract unit price per megagram (ton). Dumped, revetment, class 1, and class 2 riprap obtained from within the project limits will be paid for at the contract unit price per square meter (square yard). Uniform riprap will be paid for at the contract unit price per megagram (ton). Grouted riprap will be paid for at the contract unit price per square meter (square yard) of the specified depth. Precast concrete riprap, and concrete slopewall will be paid for at the contract unit price per square meter (square yard), all complete in place. If slag is used as dumped riprap and payment will be made per megagram (ton), the pay quantity will be adjusted in accordance with 904.02(a).

The accepted quantities of geotextiles used under riprap will be paid for at the contact unit price per square meter (square yard), complete in place.

Inspection holes will be paid for at the contract unit price per each.

The treatment of undermined paved side ditch will be paid for at the contract unit price per meter (linear foot) for paved side ditch, break. Backfill required for treatment of

paved side ditch will be paid for at the contract unit price per cubic meter (cubic yard) for borrow, cohesive.

Payment will be made under:

Pay Item (Pay Item)	**Metric Pay Unit Symbol (English Pay Unit Symbol) Pay Item Metric Pay Unit Symbol (Pay Item English Pay Unit Symbol)**
Borrow, Cohesive	m3 (CYS)
Geotextiles	m2 (SYS)
Inspection Hole	EACH
Paved Side Ditch, Break	m (LFT)
Riprap, Class _____	Mg (TON) m2 (SYS)
Riprap, Dumped	Mg (TON) m2 (SYS)
Riprap, Grouted, _____ mm depth (Riprap, Grouted, _____ in. depth	m2 SYS)
Riprap, Precast Concrete	m2 (SYS)
Riprap, Revetment	Mg (TON) m2 (SYS)
Riprap, Uniform	Mg (TON)
Slopewall	m2 (SYS)
Slopewall, Concrete, _____ mm depth (Slopewall, Concrete, _____ in. depth	m2 SYS)

If the contract includes a pay item for removing materials from within the project limits which are used as grouted riprap, the cost of such removal shall be included in the cost of the pay item for the removal work. The cost of placing such material shall be included in the cost of the riprap pay item.

The cost of paved ditch required at the top of riprap and along the edge of riprap will be paid for in accordance with 607.06. The cost of welded steel wire fabric shall be included in the cost of the slopewall.

The cost of excavation below the finished riprap or slopewall surface shall be included in the cost of the riprap and slopewall pay items. The costs of excavation, grading, sewing, pinning, and necessary incidentals shall be included in the cost of geotextiles.

SECTION 617 -- Blank

SECTION 618 -- Blank

SECTION 619 -- PAINTING

619.01 Description. This work shall consist of preparing surfaces and furnishing and applying paint in accordance with these specifications or as directed.

MATERIALS

619.02 Materials. Materials shall be in accordance with the following:

Encapsulation Bridge Paint System	909.03
Multi-Component Inorganic Zinc Primer	909.02(a)1b
Organic Zinc Primer	909.02(a)3
Single Component Inorganic Zinc Primer	909.02(a)2
Two Component Inorganic Zinc Primer	909.02(a)1a
Two-Component Water Based Primer	909.02(a)1c
Vinyl Finish Paint	909.02(b)
Waterborne Finish Paint	909.02(c)

CONSTRUCTION REQUIREMENTS

619.03 General Requirements. Except as modified herein, all surfaces to be painted shall receive one coat of inorganic zinc primer and one coat of waterborne finish paint to be applied in accordance with the manufacturer's specifications. The dry film thickness of the coating will be measured with a calibrated film thickness gauge. Opportunities to check the film thickness of each coat of paint applied shall be afforded in accordance with 619.04.

Surfaces to be painted shall be cleaned in accordance with SSPC classification, unless otherwise specified. The Contractor shall provide the Engineer with a copy of the latest blasting comparison chart available from the SSPC. Field blast cleaned surfaces shall be primed the same day as blasted. If rust forms after blast cleaning, the surface shall be blast cleaned again before painting. Steel which has rusted subsequent to blast cleaning shall not be painted. If a disagreement arises as to whether a surface is adequately cleaned or painted, work shall be stopped. The Engineer shall be notified in writing of the problem.

No claim shall be made for damage, including but not limited to, damages for delay, increased expense, maintenance, startup costs, additional costs due to passage of time arising out of dispute, or work stoppage relating to whether a surface is adequately cleaned or painted.

All cleaning and painting shall be done by an SSPC certified contractor. This requirement will not apply to shop painting.

No lettering shall be painted on bare or painted structural steel except for marks required for erection, and that described in 619.08(h).

Drain castings shall be satisfactorily cleaned and painted with black field paint. The castings shall not be shot blasted. If the castings are sandblasted, a brush-blast technique shall be used.

619.04 Inspection Access to Bridges. The Contractor shall provide the Engineer with safe and reasonable access to all points of the bridge for the purpose of inspection at the

time the Engineer requests such inspection. The Contractor shall obtain, maintain, and keep the inspection access equipment in safe working order.

The Contractor shall obtain permission to continue or start work at the inspection hold points as follows:

(a) Prior to the start of work
(b) Immediately following surface preparation
(c) Immediately before the application of the first coat
(d) Prior to the application of each succeeding coat
(e) After the final coat has cured

619.05 Surface Preparation.

(a) Pressure Washing. All surfaces to be painted and the tops of pier and abutment caps shall be washed prior to solvent cleaning. The washing shall be accomplished by means of low pressure power water washing with potable water. Such pressure shall be between 5.5 and 10.3 MPa (800 and 1,500 psi). If detergents or other additives are added to the water, the surface shall be rinsed with potable water before the detergent water dries. All washed surfaces shall be completely free of all foreign matter and shall be subject to approval prior to solvent cleaning.

(b) Solvent Cleaning. After washing has been approved, all traces of asphaltic cement, oil, grease, diesel fuel deposits, and other soluble contaminants which remain on steel surfaces to be painted shall be removed by solvent cleaning. Abrasive blasting shall not be done to areas which contain these contaminants nor to areas not approved. Solvent cleaning shall be in accordance with SSPC SP1, Solvent Cleaning, Section 4, Methods of Solvent Cleaning. The Contractor shall ensure that the cleaning does not damage existing coatings which are to remain. Solvent cleaning shall be subject to approval prior to surface preparation activities.

(c) Near-White Blast Cleaning. A near-white blast cleaned surface, when viewed without magnification, shall be free of all visual oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, or other foreign matter, except for staining. Near-white blast cleaning shall otherwise be in accordance with SSPC SP 10.

(d) Commercial Blast Cleaning. A commercial blast cleaned surface, when viewed without magnification, shall be free of all visual oil, grease, dirt, dust, mill scale, rust, paint, oxides, corrosion products, or other foreign matter, except for staining. Staining shall be limited to not more than 33 percent of each 650 mm^2 (1 in^5) of surface area. Staining may consist of light shadows, slight streaks, or minor discolorations caused by stains of rust, stains of mill scale, or stains of previously applied paint. Slight residues of rust and paint may also be left in the bottoms of pits of the original surface. Commercial blast cleaning shall otherwise be in accordance with SSPC SP6.

(e) Hand Tool Cleaning. Cleaning and painting shall be so programmed that dust or other contaminants do not fall on wet, newly-painted surfaces. All loose, non-adherent paint, rust or rust scale shall be removed in accordance with SSPC SP2 Specification for Hand Tool Cleaning before the steel is washed. Peeling or flaking paint shall be thoroughly removed with scraping tools until the remaining existing coating cannot

be lifted or peeled away from the steel surface. Rusted areas shall be thoroughly wire brushed.

(f) Brush-Off Blast Cleaning. A brush-off blast cleaned surface, when viewed without magnification, shall be free of all visible oil, grease, dirt, dust, loose mill scale, loose rust, loose coatings, paint, crayon, concrete spatter and other foreign matter which affects natural oxidation of the steel. Brush-off blast cleaning shall otherwise be in accordance with SSPC SP7.

(g) Special Cleaning Methods. Where areas exist on a bridge such as ornamental handrails, lattice work, inaccessible areas, or other such appurtenances, special cleaning methods may be required to be in accordance with the cleaning requirements. Such special methods may include hand chipping, scraping, or grinding to remove all loose paint, scale, or rust.

619.06 Pollution Control. Blasting materials, scrapings, wire brushings, and paint particles shall be contained in accordance with SSPC-Guide 6 (con) Class 3 specifically for zinc primed bridges, and SSPC-Guide 6 (con) Class 2 for lead primed bridges. The waste shall be disposed of in accordance with EPA requirements. Waste material shall be disposed of as approved by the IDEM Office of Solid and Hazardous Waste. Workers shall be protected in accordance with Indiana OSHA requirements. Such protection for work on lead primed bridge shall include, but shall not be limited to, ventilators, protective hoods, clothing, and a 2-area changing room and wash area.

The paint removal operation shall not be started until the containment procedure has been submitted in writing by the Contractor and received by the District Construction Engineer. The use of an approved boom or flotation device will also be required as a backup containment device if the bridge is over water. If a spill, as defined in IDEM Regulation 327 IAC 2-6, does occur, all work shall cease and immediate action shall be taken to clean up the site. Spills of material which enter or threaten to enter the water shall be handled in accordance with IDEM Regulation 327 IAC 2-6. All other Federal, State, and local rules and regulations described in 619.14(a) which pertain to bridge cleaning and painting shall be observed.

The IDEM Emergency Response Branch at 317-233-7745, the local health department, and all water intake users within 150 m (500 ft) of the bridge shall be contacted and immediately advised of the spill. Written documentation of all such contacts shall be kept.

Lead primed bridges may generate hazardous waste when the primer coat is removed. The Contractor shall recycle the blasting material when blasting lead primed bridges.

The recycling equipment shall be capable of separating the blasting debris from the paint debris. The residue from the bridge shall be sampled within the first 5 days of removal and shipped to be tested. Residue shall be placed in an approved container. Such container shall be labeled and maintained to prevent rain water from entering. The material shall be disposed of at an approved sanitary or hazardous waste landfill in the State of Indiana. All hazardous waste generated will be disposed of as required by the EPA and the IDEM Office of Solid and Hazardous Waste.

No waste material shall remain on the booms or on the water surface overnight. An alternate method to the booms may be used provided it may be shown to be effective and is approved by the Engineer. All blasting debris shall be cleaned up after each day's work.

All waste material shall be properly stored at the project site to prevent loss or pollution. Such material shall subsequently be tested and disposed of at a disposal site approved by the IDEM Solid Waste Management Section. Blasting and cleaning shall not be performed on days when the wind is of such velocity to prevent the containment of the paint particles. A copy of the Toxicity Characteristics Leaching Procedure test results, all disposal receipts, manifests and required paperwork for disposal shall be given to the Engineer before the contract is accepted and final payment is made.

If the Contractor has an alternate plan for the disposal of the hazardous waste materials, such plan may be submitted in writing to the IDEM. If approved by the IDEM, such plan may be used as an alternate to the above disposal requirements. Copies of all correspondence to the IDEM shall also be forwarded to the Engineer.

Minimum allowable fugitive dust shall be in accordance with IDEM Regulation 326 IAC 6-4.

619.07 Paint Systems.

(a) Paint System No. 1. This system shall be used where the entire structure is to be cleaned and painted. This system shall be in accordance with 909.02(a)1a, 909.02(a)1b, 909.02(a)1c, 909.02(b), 909.02(a)2 and 909.02(c). It shall consist of an inorganic zinc primer with a minimum dry film thickness of 65 :m (2.5 mils) and a waterborne or vinyl finish coat with a minimum dry film thickness of 75 :m (3.0 mils) having volatile organic compounds which are in accordance with IDEM requirements.

The outside surface areas of all outside beams and the shoe assemblies under all expansion joints shall be given a second waterborne or vinyl finish coat with a minimum dry film thickness of 65 :m (2.5 mils), or that which is in accordance with the manufacturer's recommendations, whichever is greater.

(b) Paint System No. 2. This system shall used for spot painting of existing zinc primed bridges. This system shall be in accordance with 909.02(a)3 and 909.02(c). It shall consist of one coat of organic zinc primer with a minimum dry film thickness of 65 :m (2.5 mils) and a waterborne finish coat with a dry film thickness of 75 :m (3.0 mils).

(c) Paint System No. 3. This system shall be used for encapsulating existing lead primed bridges. A cleaning method which is in accordance with 619.05(e) shall be used for encapsulation. This system shall be in accordance with 909.03. It shall consist of a rust penetrating sealer, a prime coat of corrosion inhibited primer with a minimum dry film thickness of 75 :m (3 mils) and a wet film thickness of 125 :m (5 mils) on areas where the paint has been removed, and a topcoat with a dry film thickness of 125 to 175 :m (5 to 7 mils) and a wet film thickness of 200 to 255 :m (8 to 10 mils). A rust penetration sealer shall be applied in jointed and bolted areas which is compatible with the topcoat system.

619.08 Painting.

(a) General Requirements. Concrete at all junction points of concrete and steel shall be adequately shielded or otherwise protected so that application of paint on steel is full and complete, and that spraying onto the concrete is minimized.

If a blasted or painted surface is unsatisfactory, removal of the paint, thorough cleaning of the surface, and repainting or other correction will be required as directed.

The primer shall be of such color as to produce a distinct contrast with a blast cleaned metal surface and the waterborne finish coat.

All members which are inaccessible to field painting after being placed in final position shall have been given the waterborne finish coat before being erected.

Paint shall be applied by means of either airless or conventional spray methods which have been approved by the paint manufacturer. However, areas which are inaccessible to spray application or small touchup areas may be painted by means of brushes or daubers.

The Contractor shall provide the Engineer with material safety data sheets for all materials used on the work site, at the time the material arrives on the project site.

If paint is permitted to remain in storage, the containers shall be turned end for end at least once each week.

Paint shall be mixed before it is applied. The pigment shall be kept in uniform suspension during application. If paint cannot be mixed properly by means of hand methods, mechanical mixers shall be used in accordance with the manufacturer's instructions.

Field painting will not be permitted between November 15 and the following April 1.

All other necessary precautions shall be taken to minimize dust and dirt from blowing onto the cleaned or freshly painted surface.

Pedestrian, vehicular, or other traffic on or underneath the bridge, and all portions of the bridge superstructure and substructure shall be protected against damage or disfigurement from splatters, splashes, and smirches of paint materials, sand, or shot.

(b) Maintaining Traffic. The roadway may be restricted to one lane of traffic when blast cleaning or painting a portion of a structure that is over the traveled roadway, or when it is determined by the Engineer that the need exists.

Traffic maintenance shall include a type of barrier system which shall protect against direct blasting of vehicles or pedestrians, eliminate abrasive materials and debris from falling onto the traveled portion of the pavement, and prevent the spreading of abrasive materials and debris in the area which may create a traffic hazard. Traffic maintenance shall otherwise be as shown on the plans.

If the intended purpose of the protective devices is not accomplished, work shall be suspended until adequate corrections are made. All abrasive material or debris shall be removed the same day.

Construction signs in accordance with 801.03 shall be furnished and placed as shown on the plans. However, a "Bridge Painting Ahead" sign shall be used in place of the "Road Construction Ahead" sign.

(c) Prosecution of Work. Prosecution of work shall be in accordance with the applicable requirements of 108.03. Once the operation of cleaning and painting is begun, it shall be prosecuted on all work days, except Saturdays or Sundays, without stoppage, until all work is completed. When required, the schedule shall indicate the sequence in which the structures are proposed to be painted when more than one structure is included in the contract. Once work is begun on a structure, it shall progress continually until completion, including all cleanup.

(d) Claims. No claim shall be made arising out of paint used in excess of the minimums required by the contract or for the stoppage of work due to a dispute of the calibration of the thickness gauge. Each bridge shall be inspected before bidding for the exact type of primer that exists on each bridge.

(e) Responsibility for Damage. All persons and property shall be protected from damage or injury from the paint, painting operations, and blast cleaning operations. Persons and property shall include, but shall not be limited to, pedestrians, vehicular, or other traffic upon or underneath a bridge, all portions of the bridge superstructure and substructure, and all adjacent property. The Contractor shall be responsible for damages in accordance with 107.16.

(f) Paint Mixing. Before paint is applied it shall be thoroughly mixed so that the pigment is completely in suspension and the consistency is uniform. It shall be kept in such condition while it is being applied. If 2-component inorganic zinc primer is selected, it shall, after initial mixing and before application, be strained through a metal screen of not coarser than the 600 :m (No. 30 sieve).

(g) Paint Thinning. The thinning of field paint will be permitted when required for proper application. Only thinners specified or recommended in writing by the manufacturer and approved by the Engineer may be added in accordance with the manufacturer's written recommendations. The maximum quantity added shall not exceed the manufacturer's recommendations. The thinned paint shall not exceed IDEM regulations for volatile organic compounds. The Contractor shall provide the Engineer with the manufacturer's technical data sheets and application instructions for the thinner and it use in the field. Technical data sheets will be required for all paints used on the project.

(h) Paint Application. Paint shall be applied only to metal surfaces which are in accordance with the manufacturer's specification for temperature. Paint shall not be applied when the air is misty, or when conditions are otherwise unsuitable. The surface temperature of the steel to be painted shall not be within 3EC (5EF) of the dew point. When painting in a protected area to eliminate the above conditions, the steel shall remain under cover until the paint is dry. All wet paint which is exposed to excessive humidity, rain, snow, or condensation shall be permitted to dry. Damaged paint shall then be removed. The surface

shall be recleaned and repainted. The Engineer will have sole authority to decide when work begins or stops due to weather conditions.

Primer paints shall be applied at a minimum dry film thickness of 65 :m (2.5 mils) or that which is in accordance with the manufacturer's recommendations, whichever is greater. If the proper dry film thickness of the inorganic zinc primer is not obtained with one coat, all surface contaminants shall be removed. An additional coat shall be applied. The dry film thickness of the inorganic zinc primer shall not exceed the manufacturer's specifications.

Spray shall be adjusted to produce a uniform coating. All 90 degree edges shall be painted first, striped, and then repainted with the remaining steel surfaces. Painting techniques shall minimize dry overspray when using inorganic zinc primer. Excessive dry overspray shall be removed before application of the waterborne finish coat.

Where defects or damages occur in a film of inorganic zinc primer, all defective areas shall be removed to soundly bonded paint and recoated to the specified thickness.

After the finish coat is approved, copy shall be painted with a stencil in 50 mm (2 in.) black capital letters, onto the outsides of both facia beams, facing traffic, near the end bent as follows:

_____
structure number

_____
contract number
PAINTED _____
date

619.09 Shop Painting. All structural steel, except for ASTM A 709M Grade 345W (ASTM A 709 Grade 50W), which involves erection shall receive an inorganic zinc primer, including contact surfaces of high strength bolted connections and areas in contact with concrete. The top of the flange shall not be painted where shear connectors are used. ASTM A 709M Grade 345W (ASTM A 709 Grade 50W) steel shall be left unpainted except as shown on the plans.

Surfaces other than the contact surfaces described above, which are inaccessible after erection, shall be painted in the shop with the full paint system required on the completed structure.

Machine finished surfaces for sliding contact shall be coated with heavy grease as soon as practicable after being accepted, but before removal from the shop.

Erection marks may be painted on zinc painted surfaces. Shop painted beams shall not be loaded for shipment until paint is dry.

All structural steel shall be cleaned in accordance with 619.05(c).

The finish coat for painted ASTM A 709M Grade 345W (ASTM A 709 Grade 50W) steel shall be in accordance with Federal Color Standard 595a, color No. 30045.

619.10 Field Painting New Steel Bridges. All structural steel which has received inorganic zinc primer, except contact surfaces or surfaces to be in contact with concrete, shall be painted after erection with the waterborne finish coat. If the specifications do not permit the material to receive an inorganic zinc primer in the shop before incorporation into the structure, the surfaces which are exposed shall be cleaned in accordance with 619.05(c) before paint is applied thereto. Such surfaces shall receive the inorganic zinc primer after erection.

Before application of the waterborne finish coat, all areas where the inorganic primer was damaged during shipping, handling, and erection, and all bolts and field connections shall be cleaned in accordance with 619.05(c) and painted with inorganic zinc primer to a condition equal to that required for the inorganic zinc primer applied in the shop.

This requirement will not apply to temporary steel structures.

Where surfaces have been painted with the full paint system but the paint coating has been damaged, the damaged areas shall be removed in accordance with 619.05(c) back to soundly bonded paint. Both the inorganic zinc primer and the waterborne finish coat shall be reapplied.

619.11 Painting Existing Steel Bridges. This work shall consist of washing, cleaning, and preparing all surfaces to be painted, containment of paint debris, furnishing and applying all paint, the maintenance and protection of all pedestrian and vehicular traffic, and the protection of the structure and other property against damage that may result from the work.

All trash, debris, or other foreign substances shall be removed from pockets and crevices of truss spans. Such substances shall be cleaned from around bearing plates and shoe assemblies. The entire surface of the beam or truss seat on each unit of the structure shall be cleaned.

The surfaces to be cleaned and painted shall include the surfaces of all steel members of the superstructure, substructure, floor beams, stringers, plates, castings, bearing assemblies, ornamental handrails, lattice work, or other such appurtenances.

The bridge steel shall be cleaned in accordance with 619.05(a), 619.05(b), 619.05(d), and 619.05(g). The paint system shall be in accordance with 619.07(a) and 909.02.

After completion of the top finish coat, the cover plates of end posts and the ends of plate girders and trusses at each end of the bridge shall be painted with 200 mm (8 in.) alternate black and white stripes sloping down at an angle of 45 degrees, toward the side on which traffic passes. The stripes shall be white and black finish paint. White painted lines shall be immediately reflectorized by applying glass beads at a uniform minimum rate of 0.7 kg/L (6 lb/gal.) of glass beads per 3.8 L (1 gal.) of paint. The striping shall extend from the floor level to the connection point of the cross-portal member, the top of the chord, or to a point which is 3.7 m (12 ft) above the bridge floor, whichever is lowest.

619.12 Encapsulation of Existing Steel Bridges. The encapsulation of an existing steel bridge shall consist of surface preparation in accordance with 619.05(a), 619.05(b), 619.05(e), and 619.05(g) and application of rust penetrating sealer, spot priming, and topcoating. The paint system shall be in accordance with 619.07(c) and 909.03.

(a) Rust Penetration Sealer. The rust penetration sealer shall be compatible with the topcoat material. Such low viscosity, penetrating coating shall be used as a penetrating pre-primer for jointed or bolted areas of steel structures and rocker assemblies which suffer from rusting.

(b) Spot Priming. After loose or peeling paint has been removed in accordance with 619.05(e), areas shall be primed by using corrosion inhibited primer which is compatible with the total system. Such primer shall have a dry film thickness of 75 :m (3 mils), and a wet film thickness of 125 :m (5 mils). The primer shall be permitted at least a 24 hour cure period at 16EC to 27EC (60EF to 80EF) ambient temperature before topcoating. The cure period shall be longer at lower temperatures.

(c) Topcoating. The topcoat material shall be applied to achieve a dry film thickness of 125 to 155 :m (5 to 7 mils) and a wet film thickness of 200 to 255 :m (8 to 10 mils).

(d) Application Limitations. The paint shall be applied only when product, air, and surface temperatures are above 4EC (40EF), and the surface temperature is at least 3EC (5EF) above the dew point. Weather conditions shall be such that the coated areas shall not be subjected to rain or water contact for a 24 hour period after application. At least 24 hours cure time shall be permitted in fair weather before recoating. If the joint area appears tacky or oily after an overnight cure period, it may be topcoated in such condition. Intercoat adhesion shall be confirmed when recoating a sealed joint area.

The coating shall be thoroughly mixed by hand to ensure homogeneity. The coating shall not be thinned. The coating shall be applied by means of spray, aerosol can, or brush. If the coating runs or sags, runs shall be smoothed out with a brush. Excess coating and moisture shall exit from the lower edge of the joint. Wet film thickness measurements will not be taken where rust penetrating sealer has been applied due to the porous nature of the rust layer and the inaccessibility of the area inside the joint.

Enough rust penetrating sealer shall be deposited to thoroughly wet the joint seams. The upper edge of all seams shall be coated first, then worked down the sides of the joint from top to bottom, and thoroughly wetting the seam with coating so as to propel the material into the joint. Moisture shall be displaced from the joint. Moisture shall be permitted to exit freely from the bottom of the jointed area. Individual joint geometries shall be evaluated to determine the application method which results in optimal joint penetration coverage.

619.13 Quality Assurance Inspection of Blasting and Painting. The Contractor shall provide a Quality Control Plan for the application of the painting system as part of the contract requirements. The Quality Control Plan shall consist of the identification of the monitoring operations to be performed by the Contractor that will ensure quality work. The Contractor shall be responsible for the daily calibration of the Quality Control

instrumentation with the Engineer. In the case of discrepancy of calibration readings, the Engineer's readings will prevail.

The Engineer will be responsible for acceptance testing of the painting systems by means of statistical testing.

(a) Definitions.

1. Lot. A lot is defined as one day's production of either cleaning of the steel or application of each coat of paint.

2. Acceptance of One Lot. The acceptance of one day's production.

3. Rejection of One Lot. The complete rejection of one day's production.

4. Series. Ten random tests performed on a lot by the Engineer.

5. Phase. The Contractor's operations consisting of either the cleaning of steel or application of each coat of paint.

(b) Testing Procedure. The results of the random testing within a lot will be compared to the minimum readings for that phase. A reading below the minimum will be considered as a defect. If the first series of tests has not more than one defect, the entire lot will be accepted, provided no visual defects are found. If two defects are found in the series, another testing series from the same lot will be identified and tested. If the total number of defects in the first series is three or greater, the lot will be rejected.

If the total number of defects found after combining tests from series 1 and series 2 totals 4 or fewer, the entire lot will be accepted, provided no visual defects are found. If the total number of defects found after combining tests from series 1 and series 2 totals 4 or greater, the entire lot will be rejected.

If the lot is rejected, the Contractor shall take corrective action to make the lot acceptable. The Contractor shall not cover over a failed lot in its entirety, until the whole lot has been accepted.

The Engineer will have the right to reject work on the basis of visual inspection.

619.14 Environmental Requirements. Disposal of existing paint and debris shall be in accordance with the following requirements.

(a) Laws to be Observed. The disposal of lead and zinc bridge painting debris is regulated by Federal and State laws. Lead is classified as hazardous waste and shall be manifested to be disposed. Zinc is classified as a special waste.

A special-waste application form shall be submitted to the IDEM in order to dispose of special waste in sanitary landfills in Indiana. The Contractor shall have direct knowledge regarding compliance with these laws pertaining to pollution control and hazardous waste management. The environmental laws governing hazardous and special waste disposal are as follows:

1. Subtitle C of the Resource Conservation and Recovery Act, 40 CFR 261, 262, 263, 265, and 268

2. The Solid Waste Rule, 329 IAC 2

3. The Hazardous Waste Rule, 329 IAC 3

4. The Air Pollution Rule, 326 IAC 4

5. The Water Pollution Rule, 327 IAC 2-6

6. The United States Department of Transportation regulations 49 CFR 172.300

7. OSHA worker safety regulations 29 CFR 1926

(b) Requirements. There will be a 90 calendar day maximum time limit from the date the waste is generated, not from the date of the test report on its toxicity. The hazardous waste shall be accompanied by a manifest and shall be transported off the project site within such 90 calendar day time limit to a Treatment, Storage, and Disposal facility. The transporter shall have an EPA identification number.

1. Written Training Program. A written description of the type and amount of both introductory and continuing training given to each employee handling the hazardous waste will be required by 40 CFR 265.16. Records which document such training or job experience will be required. A written program and proof of employee training shall be submitted to the Engineer prior to starting cleaning operations.

2. Hazardous Waste Contingency Plan. The law requires that if the Contractor does blast cleaning on a bridge and thereby generates, handles, or stores hazardous waste, a spill contingency plan shall be made available on the project site at all times. Such plan shall address how accidental spills shall be contained and cleaned up. The plan shall show the name of an emergency coordinator along with a telephone number at which such coordinator may be reached 24 hours per day in case of an accident. A copy of the contingency plan shall be submitted to the Engineer.

3. Marking of Spent Material Containers. Spent material containers shall be marked with the date the waste was generated. Such containers will not require labeling as Hazardous Waste until the TCLP test so designates. The TCLP test is the Environmental Protection Agency's Test Method for Solid Waste: Physical/Chemical Methods [SW-846 1311]. As soon as the TCLP reports the waste as hazardous, the Contractor shall mark the containers in accordance with 49 CFR 172 Subpart D.

4. Protective Equipment. All workers and Department personnel on the project site shall wear personal protective equipment. Such equipment will be required for the environment to which the workers and Department personnel are subject. The protective equipment shall be furnished by the Contractor. The Contractor shall provide training in the use of the equipment.

The protective equipment shall include, but shall not be limited to clean air supplied respirators, air purifying respirators or conventional hood as applicable, eye protection, ear protection, protective clothing, and an appropriate washing and cleaning room.

5. Health and Safety Plan. The Contractor shall submit a written health and safety plan for removal of lead paint for steel structures. This document shall provide guidance to those responsible for the health and safety of workers involved in such work. When removing lead based paint, the air shall be monitored with 2 air monitors. These monitors shall be capable of continuously monitoring air quality during paint removal operations.

(c) Instructions. The Department will obtain the EPA identification numbers for those bridges which have been identified as having lead based paint by completing the EPA form "Notice of Regulated Waste Activity" for each bridge and sending it to the address as follows:

U.S. EPA Region V
RCRA Activities
Waste Management Division
P.O. Box A3587
Chicago, IL 60690

The EPA may be contacted at 312-353-2000. The Department is the generator. All necessary documents will be signed as required through the District representative.

The Contractor shall obtain the EPA identification numbers for the lead bridges from the Engineer. The Contractor shall perform the sampling and analysis of the paint waste debris to determine if these wastes are in accordance with current RCRA hazardous waste definitions. Upon determination that the paint waste is hazardous, the Contractor shall follow the procedure as follows:

1. Contact a disposal site within the State.

2. File request for disposal at the disposal facility. Land Ban forms and profile sheets shall be filled out for the material. The Engineer will sign such forms and sheets in order to confirm what is being disposed.

3. Schedule transportation of waste to the disposal site. The transporter is usually a one-person operation. The Contractor shall prepare to assist in loading the waste onto the truck.

4. Prepare manifests for the Engineer to sign.

A manifest shall be filled out for each bridge that has an EPA identification number. Such manifest shall show the amount of waste in kilograms (pounds) or megagrams (tons) which is generated from each bridge. However, if the TCLP test does not determine the waste to be hazardous, then a manifest will not be required. The hazardous waste from each structure shall not be consolidated into one load at one site. The transporter may consolidate the material by driving to each bridge site to empty the drums into one drop box.

Adams Center Landfill in Fort Wayne is the only hazardous waste landfill in the State.

The Contractor shall supply the Engineer with the number of copies of the manifests required by law within 45 calendar days accompanied by the disposal billing for each bridge structure before final payment will be made. The District will maintain the manifests for three years as required by law, plus the weight ticket. This information will be required on the Biennial Hazardous Waste Reports which are issued by the IDEM. Such reports are mandated by law and are issued in odd-numbered years.

610

619.15 Method of Measurement. No measurement will be made for cleaning or painting. However, existing steel bridges or other specific work will be measured by the number of bridges cleaned or painted if so specified.

Floor drain extensions will be measured per each drain extended.

The estimated weight, length, and number of steel spans and type of primer shown on the plans or in the Proposal book is incidental information. Such information is approximate only. The Department will not guarantee its accuracy.

620

619.16 Basis of Payment. Removal of existing paint from a structure will be paid for at the contract lump sum price for clean steel bridge or clean steel bridge, partial, for the structure number specified.

The accepted quantities of existing steel bridges to be painted, or spot painted, whichever is specified, will be paid for at the contact lump sum price for paint steel bridge, for the structure number or designated section of a structure specified.

The accepted quantities of existing steel bridges to be encapsulated will be paid for
630 at the contact lump sum price for encapsulate steel bridge, for the structure number specified.

The accepted quantities of specific work to be painted will be paid for at the contract unit price per each or at a contract lump sum price, as set out in the Schedule of Pay Items, complete as specified.

Drain extensions will be paid for at the contract unit price per each.

If the contract includes a pay item for maintaining traffic, such work will be paid for
640 at the contract lump sum price for maintaining traffic, for the structure number specified.

Pollution control devices required when cleaning and painting existing steel bridges will be paid for at the contract lump sum price for pollution control, for the structure number specified.

Payment will be made under:

Pay Item	**Pay Unit Symbol**
650 Clean Steel Bridge, Partial, Str. No. ____	LS

Clean Steel Bridge, Str. No. ____ .....LS
Drain Extension..... EACH
Encapsulate Steel Bridge, Str. No. ____.....LS
Maintaining Traffic, Str. No. ____ .....LS
Paint _____ .....LS, EACH
specific work
Paint Steel Bridge, Str. No. ____.....LS
Pollution Control, Str. No. ____ .....LS

The costs of all materials, equipment, and labor required for washing, solvent cleaning, scraping, steel brushing, or other acceptable methods for removing paint in the locations directed shall be included in the cost of clean steel bridge or clean steel bridge, partial.

The costs of all equipment, materials, and labor required to install the designated paint system No. 1 shall be included in the cost of paint steel bridge.

The costs of all equipment, materials, and labor required to install the designated paint system No. 2 shall be included in the cost of paint steel bridge, partial.

The costs of all equipment, materials, and labor required to install the designated paint system No. 3 shall be included in the cost of encapsulate steel bridge.

Painting will not be paid for separately unless so specified. The cost thereof shall be included in the costs of other pay items.

The costs of all equipment, material, labor, testing, and disposal of spent materials and debris shall be included in the cost of pollution control. No additional payment will be made for delays from all operations undertaken for this work. The absence of a pollution control pay item will not negate the Contractor's responsibility for complying with the pollution control requirements in all phases of this work.

The costs of providing the Department with access to the bridge, the use of special cleaning methods, handling debris containers, seasonal or weather limitations, and labor, materials, and equipment required for maintaining traffic shall be included in the costs of the pay items.

SECTION 620 -- Blank

SECTION 621 -- SEEDING AND SODDING

621.01 Description. This work shall consist of either or both plain and mulched seeding or placing approved sod. It includes furnishing and placing seed, fertilizer, inoculants, top soil, and mulch, if required, in a prepared seed bed or furnishing and placing sod at locations shown on the plans, or as directed.

MATERIALS

621.02 Materials. Materials shall be in accordance with the following:

Fertilizer 914.03
Grass Seed 914.04
Leguminous Inoculants 914.06
Mulch ..... 914.05(a), 914.05(c), 914.05(d), 914.05(e)
Plastic Net ..... 914.09(g)
Sod, including Nursery Sod 914.07
Top Soil 914.01
Water ..... 914.09(a)
Wire Staples ..... 914.09(f)

CONSTRUCTION REQUIREMENTS

621.03 Preparation of Ground Before Seeding. The area to be seeded shall be made smooth and uniform and shall be in accordance with the finished grade and cross section shown on the plans or as otherwise designated. It shall have been given final trimming in accordance with 210.

The seed bed, if not loose, shall be loosened to a minimum depth of 75 mm (3 in.) before fertilizer or seed is applied. In areas of excessive vehicular traffic, such as parking of construction equipment near a bridge repair, the soil shall be loosened to a minimum depth of 150 mm (6 in.). Areas to be covered with topsoil shall be milled or disked slightly before the topsoil is placed. A disk, spike-toothed harrow, or other similar device may be used for this purpose. Such loosening will be required to ensure bond of the topsoil with the surface on which it is put and to form a uniform surface. The topsoil shall then be spread to a sufficient depth to produce the thickness specified after it has been compacted lightly with an approved roller, tamping device, or other method.

621.04 Preparation of Ground Before Applying Erosion Control Blankets. Prior to placing the blankets, the area to be covered shall be relatively free of all rocks or clods over 38 mm (1.5 in.) in diameter, and all sticks or other foreign material, which prevent the close contact of the blanket with the seed bed. If as a result of a rain, prepared seed bed becomes crusted or eroded, or if eroded places, ruts, or depressions exist, the soil shall be reworked until it is smooth. Such areas which are reworked shall be reseeded.

621.05 Applying Fertilizer, Seed, and Mulch.

(a) Fertilizer. Fertilizer as specified shall be spread uniformly over the area to be seeded. Fertilizer shall be spread at the rate of 900 kg/ha (800 lb/acre) unless otherwise specified.

(b) Seed. Seed may be drilled in or mixed with water. The mixture shall be sprayed over the area to be seeded. An approved mechanical method which shall place the seed in direct contact with the soil may be used. In places inaccessible to mechanical equipment, or where the area to be seeded is small, a hand operated cyclone seeder or other approved equipment may be used. Seed of warm season grasses, forbs, or aquatic species shall not be covered more than 3 mm (0.125 in.). All other seed shall not be covered more than 13 mm (0.5 in.).

Leguminous seeds, unless otherwise specified, shall be inoculated with a culture in accordance with 914.06. The culture shall be mixed with sufficient water to distribute it

thoroughly. The seed shall be wetted thoroughly with the solution and allowed to dry sufficiently to be in condition for sowing. Inoculated seed shall be sown within 30 hours after the treatment. Where seeding is to be done by hydraulic methods, the inoculate may be added to the water in the spray tank.

(c) Mulch. Mulching material, when specified, shall be applied uniformly in a continuous blanket at the rate of 4.5 Mg/ha (2 tons per acre). Mulch shall be placed within 24 hours after seeding. The percent of moisture in the mulch shall be determined in accordance with 621.13(c).

Mulching material shall be punched into the soil so that it is partially covered. The punching operation shall be performed longitudinally with the mulch tiller. The tools used for punching purposes shall be disks that are notched and have a minimum diameter of 400 mm (16 in.). The disks shall be flat or uncupped such as notched coulters commonly used on moldboard plows. Disks shall be placed a maximum of 200 mm (8 in.) apart along the axle or shaft. Shaft or axle sections of disks shall not exceed 2.5 m (8 ft) in length.

The mulch tiller for punching shall be constructed so that weight may be added or hydraulic force from the tractor may push the puncher into the ground. If heavy weights are not used, several trips over the area may be necessary to work part of the mulch into the soil. Care shall be exercised to obtain a reasonably even distribution of mulch incorporated into the soil.

After procedures for holding the mulch in place have been completed, mulch, other than when applied by hydroseeder, shall be watered thoroughly. The seed or soil beneath it shall not be displaced. The mulching material shall be maintained in place satisfactorily until final completion and acceptance of the contract except as provided in 107.17. When seeding is performed between June 1 and August 15, a second thorough watering shall be applied approximately 21 days after seeding.

On slopes steeper than 3:1, or when specified, the following methods will be permitted.

1. Method A. The mulch may be held in place by means of a commercially produced mulch binder which is in accordance with all applicable State and Federal regulations. Such product shall be applied in accordance with the manufacturer's written instructions. A copy of the written instructions shall be supplied to the Engineer prior to the seeding work. The product shall contain a coverage indicator to facilitate visual inspection for evenness of application. If the mulch fails to stay in place, the Contractor shall repair all damaged areas. A change in the mulch binder may be requested by the Engineer.

2. Method B. The mulch may be held in place by spraying it with a satisfactory liquid asphalt or asphalt emulsion. The bituminous material may be applied immediately after the mulch is in place or it may be injected into the mulch as it leaves a power driven mulch spreader. If applied to the surface, the amount shall be approximately 0.25 L/m^2 (0.06 gal./sq yd). If applied as the mulch comes from the spreader, the amount shall be approximately 0.25 L/kg (60 gal./ton) of mulch material. The exact amount shall be as directed.

3. Method C. The mulch may be held in place with binder twine fastened down with wooden pegs not less than 150 mm (6 in.) long spaced 1.2 m (4 ft) apart. The twine shall be placed parallel to and also at 60 degrees with the pavement edge in both directions. The distance between the intersections of the diagonal strands measured along the strands shall be 3.7 m (12 ft). The strand parallel to the pavement shall cross the diagonal strands at their intersections to form equilateral triangles 3.7 m (12 ft) on a side.

4. Method D. The mulch may be held in place with a polymeric plastic net. The plastic net shall be unrolled such that it lays out flat, evenly and smoothly, without stretching the material. The plastic net shall be held in place by means of wire staples. The wire staples shall be driven at a 90 degrees angle to the plane of the soil slope. Staples shall be spaced not more than 1.2 m (4 ft) apart with rows alternately spaced. The plastic net shall be secured along the top and bottom of the soil slope with staples placed not more than 0.3 m (1 ft) on center. The ends and edges of the plastic net shall be overlapped approximately 100 mm (4 in.) and stapled. Overlaps running parallel to the slope shall be stapled 0.3 m (1 ft) on center and overlaps running perpendicular to the slope shall be stapled at least 0.9 m (3 ft) on center. The plastic net shall be placed with the length running from top of slope to toe of slope, or the plastic net shall be placed with the length running horizontally or parallel to the contour.

5. Method E. The area may be covered with erosion control blankets. The Contractor will be permitted to use excelsior blanket, paper mat, or straw mat.

(d) Excelsior Blankets. Excelsior blankets may be used where mulched seeding is specified or where erosion control blanket is specified. Excelsior blankets shall be placed within 24 hours after seeding operations have been completed. The ground shall be prepared in accordance with 621.04. After the area has been properly shaped, fertilized, and seeded, the blanket shall be laid out flat, evenly and smoothly, without stretching the material. Excelsior blankets shall be held in place by means of wire staples. The staples shall be driven at a 90 degree angle to the plane of the soil slope. Staples shall be spaced not more than 1.5 m (5 ft) apart in 3 rows for each strip, with a row along each edge and one row alternately spaced in the middle. The upslope edge shall be fastened by staples spaced 300 mm (12 in.) apart. The ends and edges of the blankets shall be tightly butted together, but not lapped. When excelsior blanket is used, the blanket shall be placed with the length running from top of slope to toe of slope, or the blanket shall be placed with the length running horizontally or parallel to the contour. The staples used for stapling shall be in accordance with 914.09(f).

(e) Paper Mat. Paper mat may be used for mulch for seeding where mulched seeding is specified or where erosion control blanket is specified. Paper mat shall be placed within 24 hours after seeding operations have been completed. The ground shall be prepared in accordance with 621.04.

After the area has been properly shaped, fertilized, and seeded, 2 anchor trenches shall be dug, one along the foot of the slope and the other 0.3 m (1 ft) back from the crown of the slope. These anchor trenches shall be 100 mm (4 in.) deep and at least 150 mm (6 in.) wide. One edge of the paper mat shall be placed into the top trench and stapled 230 mm (9 in.) on center. The trench shall then be filled in with soil. The paper mat shall then be unrolled such that it lays out flat, evenly and smoothly, without stretching the material. Paper mat shall be held in place by means of wire staples. The staples shall be driven at a 90

degree angle to the plane of the soil slope. Staples shall be spaced not more than 1.0 m (3 ft) apart with rows alternately spaced. The paper mat shall be secured in the bottom anchor trench in the same manner as it was secured in the upper anchor trench. The ends and edges of the mat shall be overlapped at least 100 mm (4 in.) and stapled.

Overlaps running parallel to the slope shall be stapled 460 mm (18 in.) on center and overlaps running perpendicular to the slope shall be stapled at least 230 mm (9 in.) on center. When paper mat is used, the mat shall be placed with the length running from top of slope to toe of slope, or the mat shall be placed with the length running horizontally or parallel to the contour.

(f) Straw Mat. Straw mat may be used for mulch for seeding on projects where mulched seeding is specified or where erosion control blanket is specified. Straw mat shall be placed within 24 hours after seeding. The ground shall be prepared in accordance with 621.04. After the area has been properly shaped, fertilized, and seeded, the straw mat shall be unrolled over the designated area so that the plastic mesh is on top and the straw fibers are snugly and uniformly in contact with the soil surface without stretching the material. The rolls shall be butted snugly together and stapled in place. The staples shall be driven through the blanket at a 90 degree angle to the plane of the ground surface. Each staple shall anchor the plastic mesh. The staples shall be spaced at approximately 1.0 m (3 ft) increments, both longitudinally and transversely.

For placement on slopes, the straw mat shall be placed with the length running from the top of slope to the toe of slope and shall extend a minimum of 0.9 m (3 ft) over the crown of the slope. On slope applications, 6 staples shall be installed across the uphill end of each roll. The downhill ends of the lowermost rolls across the slope shall also be anchored with 6 staples, placed on uniform spacing.

For placement in ditchlines, the straw mat shall be unrolled parallel to the center line of the ditch. The mat shall be placed so that there are no longitudinal seams within 600 mm (24 in.) of the bottom center line of the ditch. In ditchlines, six staples shall be placed at uniform spacing across the upstream end of each roll.

(g) Wood Cellulose Fiber Mulch. Wood cellulose fiber may be used where mulched seeding is specified. Wood cellulose fiber mulch shall be placed at the rate of 2200 kg/ha (1 ton/acre) within 24 hours after seeding operations have been completed. Application shall be by hydraulic mulching and consist of mixing wood cellulose fiber mulch and grass seed with water. It shall be mixed in standard hydraulic mulching equipment to form a homogeneous slurry. The slurry shall be sprayed, under pressure, uniformly over the soil surface. The hydraulic mulching equipment shall contain a continuous agitation system that keeps all materials in uniform suspension throughout the mixing and distribution cycles. Fertilizer shall be applied in accordance with 621.05(a).

621.06 Seed Mixtures. Seed mixtures shall be classified as follows. Mixes including warm season grasses, forbs, or aquatic species will be specified in the plans.

(a) Seed Mixture R. This is a general purpose seed mixture. It shall be applied at the rate of 190 kg/ha (170 lb/acre). The mixture shall consist of 43 kg (95 lb) of low endophyte Kentucky 31 Fescue or approved equal, 30 kg (65 lb) perennial rye grass, and 4.5

kg (10 lb) Jasper Red Fescue or approved equal. Fertilizer and mulching material, where specified or directed, shall be applied in accordance with 621.05.

(b) Seed Mixture U. This seed mixture shall be applied at specific locations. It shall be applied at the rate of 165 kg/ha (150 lb/acre). The mixture shall consist of 43 kg (95 lb) of a 4-way blend of turf type tall fescues such as Tribute, Rebel II, Trailblazer, or approved equal; 9 kg (20 lb) Jasper Red Fescue or approved equal; and 16 kg (35 lb) certified fine bladed perennial ryegrass such as Regal, Fiesta, Blazer, or approved equal. Fertilizer and mulching material, where specified or directed, shall be applied in accordance with 621.05.

(c) Seed Mixture P. This seed mixture shall be used on the shoulder, pavement, and median areas on grading contracts where paving is not included or on salt damaged and rutted shoulder areas. It shall be applied at the rate of 90 kg/ha (80 lb/acre). The mixture shall consist of 14 kg (30 lb) of "Fults" Puccinella Distans, 14 kg (30 lb) of Jasper Red Fescue, or approved equal, and 9 kg (20 lb) of perennial ryegrass. Fertilizer shall be applied at the rate of 450 kg/ha (400 lb/acre). Fertilizer and mulching material, where specified or directed, shall be applied in accordance with 621.05.

(d) Seed Mixture CV. This seed mixture shall be used on all 3:1 or steeper slopes. Also, it may be directed that this seeding be used on granular slopes or other slopes highly susceptible to erosion. It shall consist of adding 11 kg/ha (10 lb/acre) of seed mixture CV to the seed mixture requirements set out above for the various classes. This seed mixture shall be placed on selective areas and slopes on the prepared seed bed with an approved hand type spreader just prior to placing the specified seed mixture. The amount of inoculant used shall be two times the manufacturer's recommendation.

(e) Seed Mixture D. This seed mixture is intended for ditch situations which experience seasonal to chronic saturated soils. This seed mixture shall be used on maintenance contracts or where otherwise specified. This mixture shall be applied at the rate of 16.5 kg/ha (14 lb 12 oz per acre). The mix shall be composed of 28 g (1 oz) Fowl Mana Grass, 85 g (3 oz) wetland Carex species, 56 g (2 oz) Rice Cut Grass, 56 g (2 oz) Bullrush, 56 g (2 oz) Leptochloa fasicularis, 56 g (2 oz) Barnyard Grass, 56 g (2 oz) Prairie Wild Rye, 4.5 kg (10 lb) perennial ryegrass, 1 kg (2 lb) Jasper Red Fescue, 56 g (2 oz) "Fults" Puccinella Distans, and 0.5 kg (1 lb) Redtop. If certain species in this mix are unavailable, substitutions may be submitted for approval. The mix shall be applied as specified per hectare (acre). The method of planting shall be by means of hydroseeding or by means of a hand method with a minimal amount of mulch applied in a separate operation. Fertilizer shall not be added to this seed mixture.

(f) Seed Mixture T. This seed mixture shall be used to establish a temporary cover for disturbed soil during the construction operations. It shall be placed when directed. Seed mixture T shall also be used for late season soil stabilization and temporary ground cover. Temporary cover mixes shall not be subject to seasonal limitations as defined in 621.11. This mixture is not intended to be used as a permanent seed mixture. This mixture shall not be used to satisfy the requirements of the warranty bond.

The method of planting shall be with a rangeland no-till drill or approved equal. An alternate method of planting shall be by means of hydroseeding with mulch applied in a separate operation. The mix shall be mulched in accordance with 621.05(c)1 or 621.05(g).

Fertilizer shall be applied at the rate of 224 kg/ha (200 lb/acre). Fertilizer and mulching material, where specified or directed, shall be applied in accordance with 621.05. The mixtures shall be applied at the following rates per hectare (acre).

1. Conventional Mix. This mixture shall be applied at the rate of 90 kg/ha (80 lb/acre). The mix shall consist of 18 kg (40 lb) low endophyte Kentucky 31 Fescue or approved equal, and 18 kg (40 lb) perennial ryegrass.

2. Color Mix. The color mix may be added as a supplement to the standard turf mixes. This mixture shall be applied at the rate of 8 kg/ha (7 lb/acre). If specified, this mix shall be applied from March 15 through July 15. This mix of flowering plants may be used in high visibility areas to soften the visual impact of construction. This mix may be used in combination with the conventional mix as specified above or with other standard mixes. This mix shall consist of 2 kg (4 lb) Scarlet Flax, 0.5 kg (1 lb) Corn Poppy and 1 kg (2 lb) Painted Daisy. As an exception to this recommended mix, other annuals may be specified at a rate not to exceed 9 kg/ha (8 lb/acre).

(g) Seed Mixture Grass. This seed mixture shall be placed when specified as shown below.

1. Type 1. This seed mixture shall be placed at the rate of 220 kg/ha (195 lb/acre). The mixture shall consist of 7 kg (15 lb) of Smooth Bromegrass, 4.5 kg (10 lb) of Orchardgrass, and the mixture specified in 621.06(a).

2. Type 2. This seed mixture shall be placed at the rate of 124 kg/ha (110 lb/acre). The mixture shall consist of 7 kg (15 lb) of Smooth Bromegrass, 4.5 kg (10 lb) of Orchardgrass, 18 kg (40 lb) of Certified Common Kentucky Bluegrass, 14 kg (30 lb) of Creeping Red Fescue, and 7 kg (15 lb) of Perennial Rye Grass.

(h) Seed Mixture Legume. This seed mixture shall be placed when specified as shown below. Mulched seeding, when specified, shall be in accordance with 621.07.

1. Type 1. This seed mixture shall be placed at the rate of 214 kg/ha (190 lb/acre). The mixture shall consist of 4.5 kg (10 lb) of Sericea Lespedeza or Korean Lespedeza, 4.5 kg (10 lb) of medium Red Clover or Alsike Clover, and the mixture specified in 621.06(a).

2. Type 2. This seed mixture shall be placed at the rate of 112 kg/ha (100 lb/acre). The mixture shall consist of 4.5 kg (10 lb) of Sericea Lespedeza or Korean Lespedeza, 4.5 kg (10 lb) of medium Red Clover or Alsike Clover, 4.5 kg (10 lb) of Birdsfoot Trefoil, 18 kg (40 lb) of Certified Common Kentucky Bluegrass, 14 kg (30 lb) of Creeping Red Fescue, and 4.5 kg (10 lb) of Annual Rye Grass.

"Do Not Spray" signs shall be placed near the beginning and end of this work, at 60 m (200 ft) intervals, or as otherwise directed. The sign shall be 1.6 mm (16 gage) aluminum. The size and message arrangement shall be as shown on the plans. The sign background shall be white. The sign lettering shall be black. The sign shall not be reflectorized. Paint and primer shall be in accordance with 909.04. The sign post shall be placed as shown on the plans. The post shall otherwise be in accordance with 910.15.

621.07 Mulched Seeding. Mulched seeding, when specified, shall consist of applying the seed mixtures in accordance with 621.06(a), 621.06(b), and 621.06(c) as specified. This mixture shall include fertilizer and mulching material in the amounts set out herein. If erosion control blanket is specified, the Contractor will be permitted to use excelsior blanket, paper mat, or straw mat in accordance with 621.05(d), 621.05(e), or 621.05(f), respectively.

621.08 Preparation of Ground Before Sodding. The area to be sodded shall be smooth, uniform, and shall be in accordance with the required cross section. Surfaces prepared for sod shall be of sufficient depth below unseated areas that newly laid sod shall be in accordance with the surrounding surface.

For those areas which shall be covered with topsoil, the procedure for the application of topsoil shall be in accordance with 621.04.

After the area has been prepared for sod, fertilizer shall be applied at the rate of 450 kg/ha (400 lb/acre). The surface shall be loosened to a depth of 25 to 50 mm (1 to 2 in.) and then raked before the sod is placed. All clods, lumps, boulders, or waste material shall be removed satisfactorily.

In areas where the above method of preparation is impracticable, a different method may be approved.

621.09 Laying Sod. Sod strips shall be laid carefully by hand in the designated direction. The sod shall be fitted to the surrounding grade and fixed objects. The sod strips shall be butted together closely to avoid open joints. Overlapping of sod will not be permitted. After laying and initial watering, the sod shall be tamped or rolled as directed to ensure contact with the soil underneath and shall be in accordance with the surrounding surface. After compaction, the sod shall present a smooth even surface free from lumps and depressions. On slopes of 3:1, or flatter, the use of broken sod strips will be permitted. Where broken pieces are laid, no overlaps will be allowed.

Sod placed in ditches with grades steeper than one percent and on slopes 3:1 and steeper shall be pegged. The pegs shall be spaced not over 610 mm (2 ft) apart in each strip measured lengthwise of the strip. Pegs shall be driven down until no more than 25 mm (1 in.) protrudes above the surface of the sod. Grades and slopes flatter than specified herein shall be pegged as directed.

Pegs shall be wood at least 13 mm by 19 mm by 300 mm (0.5 in. by 0.075 in. by 12 in.). In lieu of pegs, T-shaped wire pins may be used. The pins shall be machine bent from 4 mm (8 gage) low carbon steel with a minimum of a 200 mm (8 in.) leg, a 100 mm (4 in.) head, and a 25 mm (1 in.) secondary drive. Pins shall be driven flush with the top of the sod.

621.10 Watering Sod. Sod shall be watered immediately after laying. The amount of watering shall be sufficient to saturate the sod and the upper few millimeters (inches) of the underlying soil. The sod shall be watered once everyday of the first week, once every second day of the second week, once every third day of the third week, and once a week thereafter. Sod shall be maintained for a minimum of four weeks from the time it is laid before being accepted. During periods of ample rainfall, watering may be modified to simulate the above schedule. The requirements of 107.17 shall apply.

621.11 Seasonal Limitations. The Contractor shall post a warranty bond for all permanent seeding done from October 16 through January 31. Only completed seeding with seed mixtures R, U, or P shall satisfy the requirements of the warranty bond. Seeding without mulch shall not be done between May 1 and August 15.

Sod placed during the months of June, July, and August shall be subject to the following conditions:

(a) Sod shall be in good, live, growing condition.

(b) Sod shall be placed within 36 hours after cutting and protected from damage during that period.

Winter sodding will be permitted when the temperature is above 2EC (35EF). No frozen sod shall be laid and no sod shall be laid on frozen soil. Sod shall be properly protected from drying out and shall be laid within 48 hours after cutting.

621.12 Method of Measurement. Fertilizer and mulching material will be measured by the megagram (ton). Seed mixtures will be measured by the kilogram (pound). Topsoil will be measured by the cubic meter (cubic yard) in accordance with 211.09. Mulched seeding and sodding will be measured by the square meter (square yard). Water will be measured by the kiloliter (1,000 gallons). Mobilization and demobilization for seeding will be measured per each trip, when directed, to the project site. "Do Not Spray" signs will be measured by the number of signs installed.

621.13 Basis of Payment. The accepted quantities of fertilizer and mulching material, furnished and delivered complete in place, will be paid for at the contract price per megagram (ton), except as set out below for sodding. Seed mixtures will be paid for at the contract unit price per kilogram (pound) for the class and type specified. Mulched seeding will be paid for at the contract unit price per square meter (square yard) for the class and type specified, complete in place. Topsoil will be paid for at the contract price per cubic meter (cubic yard). Sodding and nursery sodding will be paid for at the contract unit price per square meter (square yard), complete in place. "Do Not Spray" signs will be paid for at the contract unit price per each.

Payment for mobilization and demobilization for seeding will be made for the initial movement to the project site so that the seeding work, as specified, is performed. Payment will be for all work necessary to move personnel and equipment to and from the project site. Payment will also be made for additional mobilization, when directed.

Payment will be made under:

Pay Item	**Metric Pay Unit Symbol (English Pay Unit Symbol)**
Erosion Control Blanket	m2 (SYS)
Fertilizer	Mg (TON)
Mobilization and Demobilization for Seeding	EACH
Mulched Seeding _____, _____ (class, type)	m2 (SYS)

Mulching Material.....Mg (TON)
Seed Mixture _____, _____..... kg (LBS)
class type
Sign, "Do Not Spray"..... EACH
Sodding..... m2 (SYS)
Sodding, Nursery..... m2 (SYS)
Topsoil.....m3 (CYS)
Water .....kL (KGAL)

The costs of leguminous inoculants, preparing seed beds, sowing, raking, and all other necessary incidentals shall be included in the costs of seed mixtures. The costs of furnishing and placing fertilizer, seed mixtures, and mulching material, in addition to the incidentals listed above for seed mixtures shall be included in the cost of mulched seeding.

The costs of furnishing, hauling, and placing the material, including material used as tie-down, repair of areas for which mulch fails to stay in place, all labor, equipment, and necessary incidentals shall be included in the cost of mulching material.

Water will be paid for only when ordered after the 30 day period, in accordance with 621.10.

Payment will not be made for topsoil which is obtained from within the right-of-way.

The costs of fertilizer, water, excavation of earth bed, disposal of surplus material, and all necessary incidentals shall be included in the costs of sodding or nursery sodding.

(a) Warranty Bond. Permanent seeding that requires a warranty bond to meet the requirements of 621.11 shall be warranted against failure resulting from lack of germination or method of application. The seeding shall be warranted to germinate and shall be free of obvious erosion occurrences. The intent of the warranty bond shall be to permit the final acceptance of the contract and payment of the retainage. All seeding which has significantly failed to attain approximately 60 percent germination shall be replaced with no additional payment. A properly executed maintenance bond with a surety shall be provided prior to the completion of work. A warranty shall be made, with no additional payment, to replace all seeding in areas which has not effectively performed useful service as specified, as well as for the repair of designated erosion areas caused by seeding failure. Such warranty shall be in writing with proper execution of the maintenance bond with a proper surety. The warranty shall be equivalent to 1 1/2 times the cost of the seeding work completed after October 15 with a minimum bond amount of $25,000. All requirements for seeding work will still apply during the warranty period unless otherwise directed.

For the terms of the warranty, a reseeding unit shall be defined as an area equal to or larger than 185 m^2 (2,000 sq ft) in size. An erosion unit may be of an area of significance as determined.

The warranty shall cover work completed from October 16 through January 31. The Department will determine if the Contractor shall be released from the warranty. This determination will be made within 10 calendar days after documented request for inspection is made by the Contractor. Such determination will not be made prior to April 1. All

replacement work shall be finished prior to June 15 with no additional payment. The requirements of 107.16 will apply to the warranty area only. The Engineer will certify in writing as to the completion of the work and will make proper notification for the releasing of the bond.

If the Contractor does not complete the necessary repairs before June 15, and there are no justifiable reasons for the Department to grant an extension, the Contractor shall forfeit the bond for the seeding work only. If a bond is forfeited, the Contractor will be required to explain to the Department why the Contractor's experience reduction factors do not warrant an increase.

(b) Changed Fertilizer. A fertilizer may be required with a higher nitrogen content than that specified, or the fertilizer specified may be required to be enriched by adding chemicals in order to be in accordance with such requirements. All additional costs incurred due to such procedure will be paid at the prices shown by certified vouchers. Such payment will include and will be full compensation for furnishing the required chemicals, or furnishing and processing the additional materials required.

(c) Mulching. The percent of moisture shall be determined at the time the mulching material is weighed. Facilities shall be provided for weighing in accordance with 109.01(b). Arrangements shall be made in advance so that the percent of moisture will be determined at the time of weighing and that the mass (weight) of the material will be checked. Moisture content of the mulch will be determined on the basis of air dry weight as follows:

$$\text{Moisture Content \%} = \frac{\text{Wet Mass (Weight) of Sample} - \text{Air Dry Mass (Weight) of Sample}}{\text{Air Dry Mass (Weight) of Sample}} \times 100$$

The gross, or wet, mass (weight) of mulching material furnished and placed will be paid for if the moisture content does not exceed 10 percent. If the moisture content exceeds 10 percent, the mass (weight) to be paid for will be the gross, or wet, mass (weight) minus the mass (weight) of excess moisture computed as follows:

$$\text{Mass (Weight) to be paid for} = G \times \frac{110}{(100 + M)}$$

G = Gross, or wet, mass (weight) of mulching material

M = Moisture content, percent, in the mulching material to the nearest 0.5 percent

Mulching material which contains more than 50 percent moisture will be rejected. Wood cellulose fiber mulch containing more than 15 percent moisture will be rejected.

SECTION 622 -- PLANTING TREES, SHRUBS, AND VINES

622.01 Description. This work shall consist of furnishing, delivering, and planting trees, shrubs, and vines, and also seedlings for wildlife habitat. This work shall also consist of the performance of incidental planting procedures and plant establishment work to

provide a complete operation in accordance with these specifications and in reasonably close conformance with the plans or as directed.

MATERIALS

622.02 Materials. Materials shall be in accordance with the following:

Backfill Material	914.01
Fertilizer	914.03
Mulch	914.05(b)
Pipe	914.09(e)
Plants	914.08
Porous Material	914.09(d)
Tree Wound Dressing	914.09(c)
Water	914.09(a)

Soil conditioners such as peat moss or calcine clay may be added with written permission.

Guy wire shall be minimum 2.0 mm (No. 14 gage) galvanized steel wire.

CONSTRUCTION REQUIREMENTS

622.03 Care and Handling of Plants.

(a) Bare Rooted Plants. If the outside air temperature exceeds 2EC (35EF) when the plants are delivered, the plants shall be planted immediately or placed in inside or outside storage. If they are stored outside, the roots shall first be puddled in a paste solution of backfill and water. The plants shall then be separated and their root systems heeled-in by completely covering with moist soil. If they are stored inside, the roots shall be puddled in a paste solution of backfill and water. Straw, peat moss, or corncobs shall be worked in and around the root system and kept moist. Plants which are delivered in boxes, wrapped bundles, or other forms of closed containers, including trucks, and which are stored inside may remain in the container for 48 hours from time of delivery, provided the containers are opened immediately and the plants are watered if necessary.

If the outside temperature is 2EC (35EF) or less when plants are delivered, the plants shall be placed in inside storage immediately. Inside storage procedures shall be in accordance with the above requirements. Plants may be transferred to outside storage when the outside air temperature exceeds 2EC (35EF) provided they are puddled again and then heeled-in.

Temperature inside the storage building shall be maintained between 2EC (35EF) and 13EC (55EF). Plants shall not remain in storage, either inside or outside, for more than 7 days, unless otherwise permitted because of unfavorable planting conditions.

Plants may be rejected on failure to comply with these specifications.

(b) Balled and Burlapped Plants and Container Grown Plants. Plants shall be planted or placed in storage before being exposed for 10 consecutive hours at

temperatures less than 2EC (35EF). Storage of plants shall be in a moist storage building or they shall be placed outside in a compact group with balls or containers completely covered with corncobs and kept moist. Plants shall not remain in storage for more than 10 days, unless otherwise permitted because of unfavorable planting conditions.

Plants may be rejected on failure to comply with these specifications.

622.04 Collected Plants. At least 24 hours before starting to dig collected plants, notification shall be given of the time and place of digging so inspection of the work and of the plants can be made, if so desired.

Collected plants shall be dug carefully in a satisfactory manner. All operations of digging, transporting, and replanting collected plants shall be in accordance with all applicable laws and regulations of the state.

622.05 Excavation for Plant Holes. Stakes will be set to locate plant holes for each tree, shrub, or vine. The outline of each seeding bed will be staked and the planting on the required centers shall be as directed. Stakes for the staking operation shall be furnished. The location stakes shall be removed as directed. Excavation shall be such that the plant holes are cylindrical in shape with the sides approximately vertical. Material excavated from the holes may be used for backfill providing it is in accordance with 914.01. Otherwise, it shall be distributed uniformly within the construction area as directed. The excavated material shall not be stockpiled on turf or in ditches. Material unsuitable for the growth of vegetation, including rocks and boulders, shall be disposed of outside the right-of-way as directed and in accordance with 203.01 and 203.10. Plant holes shall be in accordance with the details and tables shown on the plans. If plants have not been planted within 10 days after excavation of the hole, the hole shall be refilled and re-excavated at the time of planting. No additional payment will be made for this operation.

If, after staking or excavation of the plant holes at the locations shown on the plans, it becomes apparent that the location is unsuitable for planting due to accumulation of ground water, possible flooding because of terrain conditions, or unsuitable soil conditions, plant holes shall be relocated as directed. Such relocation shall be done with no additional payment.

622.06 Planting Season. The planting season shall be from September 1 through the following May 25, with the exception that trees shall be planted from October 1 through the following April 15, provided that trees are dormant. Crown vetch plants and seedlings shall be planted only from April 15 through May 30, unless approved in writing. Bare rooted plants shall be planted only when the outside air temperature exceeds 2EC (35EF). Unless otherwise approved, deciduous plants, except those container grown, shall be dormant at the time they arrive at the work or storage site. Evergreens shall not have active terminal growth. At least 40 percent of the total number of balled and burlapped, and container grown plants, not including crown vetch plants, shall be planted from the beginning of the planting season through December 31. Bare root seedlings for wildlife habitat shall be planted from October 1 through the following April 30. Container grown seedlings for wildlife habitat shall be planted at any time.

The initial planting and spring replacements, in accordance with 622.18, shall be completed satisfactorily within the planting season which expires prior to the completion

date of the contract. These plants shall have an establishment period which shall be from the end of the specified planting period to the fall inspection. If the initial planting and spring replacements are not completed within the specified time, the completion date may be extended one year to provide an establishment period. If the completion date is extended, all requirements of 622.18 shall apply until final inspection and acceptance.

622.07 Pruning. Before the plant is placed in the plant hole, any bruised or broken parts of roots shall be cut off smoothly as approved unless otherwise specified or directed. All plants shall be pruned either before or after planting. Such pruning generally shall consist of thinning out or cutting back secondary branching to reduce the foliage by 1/3 to 1/2 in accordance with accepted horticultural practices. Pruning operations shall maintain the general crown outline and characteristic branching pattern for each species. Pruning or cutting back of terminal leaders which are over 10 mm (3/8 in.) in diameter at the point of cut will not be permitted. Broken or dead branches, or any other objectionable parts of the plant, shall be removed throughout the life of the contract. Pruning tools shall be kept sharp and shall be sterilized in denatured alcohol after each hour of use. All cut surfaces 10 mm (3/8 in.) or more in diameter shall be painted with a tree wound dressing.

Bare rooted shrubs shall be cut back to 1/2 their minimum specified height as shown on the plans. Pruning shall be performed after the shrubs have been sealed with Department seals and prior to the leaf buds breaking dormancy. At the time of the spring and fall inspections, bare rooted shrubs will be accepted at their original specified height provided they are healthy, in good growing condition, and are no less than 1/2 the minimum specified height.

622.08 Planting, Backfilling, and Watering. The plant shall be placed in the plant hole at the proper position for depth, alignment, final grade of the surrounding ground level, and vertical position of the trunk. The planting procedure shall be performed in such a manner that the top of the ball of the plant is as shown on the plans at the time of planting. The planting procedure shall be in accordance with the details as shown on the plans. Backfill material in accordance with 914.01 shall be placed around all plants except seedlings. The quantities of backfill material required per plant shall be as shown on the plans.

In areas which are designated on the plans as beds for group planting, the soil shall be tilled to a minimum depth of 150 mm (6 in.) in such a manner that all sod and vegetation is destroyed. These areas shall be tilled at least 2 times with an interval of 14 days between tilling operations. Planting may be done immediately after the second tilling. Additional tilling shall be performed if vegetation appears before mulch is applied. Sod and vegetation shall be removed in lieu of the tilling operation when the soil temperature or moisture conditions are such that the sod and vegetation would not be destroyed by tilling. At other times, sod and vegetation may be removed in lieu of tilling. If the excavation resulting from sod removal is greater than 25 mm (1 in.) deep, it shall be backfilled with topsoil to 25 mm (1 in.) above the original ground. After sod and vegetation removal and backfilling, the bed area shall be cultivated to a depth of 150 mm (6 in.). Large clods, rocks, and other debris encountered in the cultivation work and any excess soil shall be removed. The outline of beds for group plantings shall be no closer than 1.0 m (3 ft) to the center of any of the outer plants in the area.

In addition to the water applied at the time of planting, unless excessive moisture prevails, the minimum supplemental waterings required shall be 2 between May 1 and June 15, and one every 14 days between June 15 and September 15. Sufficient water shall be applied to individual plants to saturate the backfill and the mulch area. Plants in beds shall receive water equivalent to the quantity used for individual plants. Liquid fertilizer, in accordance with 622.09, may be applied with the supplemental watering and the method of application shall be as approved. Lance watering will not be permitted.

Container grown seedlings for wildlife habitat which have been planted from June 1 through August 31 shall be maintained after installation for 30 days. Maintenance shall include watering the seedlings at the time of planting and once every seven days.

(a) Plants with Bare Roots. With the plant in its proper position, the plant hole shall be backfilled with material in accordance with 914.01. The backfill material shall be worked firmly around the roots as the hole is gradually filled. The plant shall be raised gently and lowered slightly as the soil is added to help eliminate air pockets around the roots. Soil shall be added in layers of about 150 mm (6 in.) and each layer tamped to make it firm and to hold the plant perpendicular. Water shall be used to settle the soil and to eliminate air pockets around the roots, unless otherwise directed. The top 100 mm (4 in.) of soil necessary to fill the plant hole completely shall be of a very fine texture and shall be placed on top of the firmed backfill and allowed to remain loose and untamped.

(b) Balled and Burlapped Plants. Balled and burlapped plants shall be handled by the ball and placed in the holes in such a manner that the soil of the ball does not become loosened from the roots. The soil directly beneath the ball shall be firmed to minimize settling. Guy stakes shall be driven before backfilling operations begin. After the hole has been partially backfilled and the material firmed under and around the ball, the burlap shall be cut away and removed from the stem of the plant. Backfilling and firming shall then be completed in a manner to avoid loosening the soil from the root ball. Watering shall be done in accordance with 622.08(a). Backfill material shall be in accordance with 914.01.

(c) Seedlings for Wildlife Habitat. Seedlings shall be from 150 to 450 mm (6 to 18 in.) in height. Seedlings shall be planted as directed in the locations shown on the plans. Species shall be selected from the list as shown on the plans. Alternate species selection shall be subject to approval. Seedlings shall be planted no closer to each other than the distance shown on the plans. Seedlings shall not be planted in rows, but instead shall be planted in a natural appearing pattern. Failure to comply with this procedure will require the replanting of the seedlings as directed with no additional payment. All damaged seedlings shall be replaced with no additional payment if replanting is required.

622.09 Liquid Fertilizer Application. All plants shall be fertilized with a water soluble 5-10-10 fertilizer, or an equivalent amount of plant nutrients, at the rate of 0.36 kg/400 L (0.75 lb/100 gal.) of water. Fertilizer shall be applied to each installed plant until the mulched area over the plant hole is saturated. Three applications shall be made: one on or about July 1; one about August 1; and one about September 1.

622.10 Mulching. Mulch, in accordance with 914.05(b), shall be placed as a top layer around each plant as soon as it has been installed. The mulch shall cover the entire area as described in 622.08 and shall be placed around individual plants in accordance with the plans.

622.11 Guying and Staking. Guying and staking shall be in accordance with the details shown on the plans. Guy wire shall be placed through rubber hose material around each tree then twisted to secure the tree in a relatively stable position. Three wood stakes shall be spaced equally about each tree. The guy wire shall be secured to each stake at an approximately right angle. Support of multi-stem trees of 1.2 to 1.8 m (4 to 6 ft) in height shall consist of inner limb guying and bracing stakes. The securement point and placement of guy wire shall be so as to avoid abrasion of tree limbs. The guys and stakes shall be maintained for the duration of the contract. Prior to final inspection, all materials used to support trees shall be removed and disposed of, except as otherwise directed for trees requiring additional bracing time. However, supports for fall replacement shall remain in place. If approved, stakes may be left flush with the ground.

622.12 Plant Protection.

(a) Borer Control Coatings. Within five days after planting and prior to wrapping, all trees, except evergreens, shall be protected against borer attack with an insecticide mixture applied to the tree trunk with a paint brush or a suitable hand sprayer. The application shall cover the trunk from the root crown to the first major branches. The mixture shall consist of enough powdered skim milk to form a smooth slurry when added to either dieldrin 18 at the rate of 1 L to 100 L (2 qt to 50 gal.) of water or thiodan 50 at the rate of 1 kg to 420 L (1 lb to 50 gal.) of water.

(b) Wrapping for Rodent Protection. Within seven days after planting, all crabapple and shade trees with a 13 mm (0.5 in.) diameter or larger, except for multi-stem forms, shall be wrapped with a double layer of 71 by 55 wires per 10,000 mm^2 (18 by 14 wires per square in.) aluminum mill finish screen wire mesh around the trunk of each tree as shown on the plans. The height of screen wire shall be from the existing grade to below the lowest branch. The screen wire shall be overlapped at the ends. The screen wire shall be secured to itself with hog rings or other approved methods, and to the rods by approved means.

Plastic coil type protective wrapping will be acceptable as an alternative to the screen wire and reinforcement rod method of tree protection for staked trees of less than 50 mm (2 in.) caliper. The wrapping shall be loosened twice each calendar year. The first adjustment shall be made between May 15 and June 15. The second adjustment shall be made between September 1 and September 30. The plastic tree protective wrapping shall extend to the height of the bottom limb.

The Contractor may submit other proposed methods of rodent protection to the Department's landscape architect for approval prior to installation. The design of the protection shall ensure an average air space diameter of 50 mm (2 in.) greater than the tree's calipered size at installation. The protection shall permit air movement through its surface to dry the tree trunk following periods of precipitation. The protection shall not damage the tree nor hinder its growth.

Multi-stem trees shall be wrapped with commercially available wrapping paper wrapped tightly around the trunks from the ground to the lowest branch with a minimum of 13 mm (0.5 in.) overlap. The wrapping paper shall be tied securely with stout cord at top and bottom and at two intermediate intervals.

622.13 Retaining Walls and Tree Wells. Retaining walls around the roots of trees or shrubs, and tree wells around the trunks of trees or shrubs shall be constructed at the locations and to the shape and dimensions shown on the plans or as otherwise designated. They shall be of mortar and masonry, or other type as specified. Mortar shall not be used in any portion of the tree well extending below the top of contiguous porous material used for tree root protection. The inside face of a tree well shall be no less than 0.6 m (2 ft) from the outside edge of the trunk of the tree or shrub. No material shall be placed between the tree trunk and the wall of the tree well.

622.14 Tree Root Protection. Where tree root protection is specified, the entire area of the root spread shall be protected. The limits of this area shall be as designated, but in general this area corresponds to the area of the ground surface lying beneath the limb spread of the tree. The area shall be cleaned of all vegetation and debris. Porous material, in accordance with 914.09(d), shall be placed uniformly over the area to a depth in proportion to the height of fill, varying proportionally from 75 mm (3 in.) for fills of 300 mm (1 ft) or less to 300 mm (12 in.) for fills of 1.2 m (4 ft) or more, or to such other depths as may be designated. A layer of No. 23 sand or other approved material shall then be placed in sufficient quantity to choke the top layer of porous material and will be measured and paid for as porous material.

Where the earth fill is less than 300 mm (12 in.) and tree root protection is specified without the construction of a tree well, the thickness of the porous material at the tree trunk shall be increased to the height of the fill and extend outward from the tree trunk in collar form for a distance of 300 mm (12 in.), unless otherwise shown on the plans.

No fill shall be placed over the root spread of any tree or shrub that is to be protected in the above manner until the required depth of porous material has been placed.

622.15 Pipe Underdrains. Pipe underdrains, when shown on the plans or directed, shall be placed to drain tree wells or porous material for tree root protection. These shall be placed in accordance with applicable provisions of 718.

622.16 Damage to Plants. During all operations of tree protection, care shall be used to prevent unnecessary cutting of roots and to prevent scarring or damage to selected trees or shrubs. Motorized equipment shall not be operated within the drip line of trees unless permitted. Where trimming of branches or cutting of roots is necessary, all cuts shall be made cleanly with proper sharp tools in accordance with generally accepted horticultural practices. Scarred areas and cut surfaces 10 mm (3/8 in.) or more in diameter shall be covered completely with a tree wound dressing.

622.17 Grass and Weed Control. Weeding and mowing of grass in and around all group plantings, beds, and individual trees and shrubs shall be performed until final acceptance. The grass and weed control areas shall be the areas within 0.6 m (2 ft) of the outer limits of all group plantings and shrub beds and within 0.6 m (2 ft) of the outer limits of the mulch area of individual shrubs. For the care of individual trees, the area shall extend to a perimeter centered from the plant itself to 0.6 m (2 ft) beyond the stub stakes of the guy wires or 0.6 m (2 ft) beyond the mulched area. In general, these areas shall be in accordance with the plans.

622.18 Care, Inspection, and Replacement.

(a) Care. Watering, fertilizing, weeding, cultivating, spraying to control insect infestation and disease, and all other good horticultural practices necessary to maintain the plants in a living healthy condition shall be performed up to the time for termination of responsibility for care as set out herein. The plants shall be cared for throughout the life of the contract. All plants stolen, damaged, or destroyed by fire, automobiles, vandalism, or any other cause, with the exception of plants damaged or destroyed by Department maintenance operations, shall be replaced with no additional payment as soon as practicable. Plants damaged or destroyed by the Department will be replaced by the Department prior to the date of final acceptance.

(b) Inspection and Replacement. On or about May 1, a spring inspection of initial plantings will be made during and before the end of the planting season and prior to the beginning of the establishment period. Plants not living, unhealthy, in a poor growing condition, or otherwise not meeting the specifications shall be replaced with no additional payment, prior to May 15 for trees and prior to May 25 for other plants. These replacements shall be in accordance with all other requirements of the initial planting. All plants found to be not living or in an unhealthy condition between this replacement and final inspection shall be removed from the project immediately, as directed, and shall be replaced after September 15 as detailed below.

A fall inspection will be made on or about September 15, at which time the condition of the materials planted within the specified planting season will be determined. At the time of this inspection, all plants which are found to be dead, unhealthy, in a poor growing condition, or otherwise not meeting the specifications will be rejected. Rejected plants shall be removed and disposed of as soon as practicable and replaced prior to November 15 with no additional payment. Replacement materials and operations shall be in accordance with the requirements of the initial planting.

A final inspection of the contract will be made as soon as possible after replacement. All plants shall be cared for and maintained until final inspection and acceptance.

All seedlings for wildlife habitat shall be in accordance with ASNS Seedling Trees and Shrubs and will be inspected by a landscape architect within one week of planting. Spring and fall inspections as described above will not be required. The inspection, planting, and maintenance of seedlings as required will constitute final acceptance.

622.19 Crown Vetch Plants and Seedlings. The requirements of 622.09 and 622.18 will not apply to these items. Seedlings shall be fertilized as specified on the plans. Crown Vetch plants and seedlings, including replacements, shall be watered as necessary to keep them in a living, healthy, and good growing condition.

On or about June 5, these items will be inspected. If it is estimated that 90 percent or more of the plan quantity of any individual item in a specific area is living, healthy, and in a good growing condition, replacements will not be required. If less than 90 percent are alive, healthy, and in a good growing condition, all items not meeting these requirements shall be replaced. Replacements shall be marked in the same manner as the original planting, except the markers shall be yellow.

Replacement planting shall be accomplished prior to June 15.

A final inspection will be made on or about the following September 15. If it is estimated that 90 percent of the contract quantity of any individual item is living, healthy, and in a good growing condition, payment will be made for the contract quantity. If less than 90 percent meet these requirements, the pay quantity for the item will be established.

622.20 "Do Not Mow or Spray" Signs and "Do Not Disturb" Signs. These signs shall be placed at the boundaries of areas where seedlings for wildlife habitat have been placed. The locations and spacing of the signs shall be shown on the plans or as directed. The sign shall otherwise be in accordance with 621.05(h).

622.21 Method of Measurement. Furnishing and planting trees, shrubs, and vines will be measured by the number of units of each type and size specified, installed, and accepted. Seedlings for wildlife habitat, "Do Not Mow or Spray" signs, and "Do Not Disturb" signs will be measured by the number installed and accepted. Retaining wall masonry, either mortared or not mortared as specified, will be measured by the cubic meter (cubic yard). Porous material for root protection will be measured by the megagram (ton). Drain tile will be measured by the meter (linear foot).

622.22 Basis of Payment. The number of trees, shrubs, and vines of each variety planted, determined as provided above, will be paid for at the contract unit price per each for plant, of the type, form, and size shown in the Schedule of Pay Items. Seedlings for wildlife habitat, "Do Not Mow or Spray" signs, and "Do Not Disturb" signs will be paid for at the contract unit price per each.

Masonry wall and masonry tree well will be paid for at the contract unit price per cubic meter (cubic yard). Porous material for root protection will be paid for at the contract unit price per megagram (ton). Drain tile will be paid for at the contract unit price per meter (linear foot) of the diameter specified.

Payment will be made under:

Pay Item Metric Pay Item (English Pay Item	Metric Pay Unit Symbol (English Pay Unit Symbol) Metric Pay Unit English Pay Unit Symbol)
Drain Tile, _____ mm diameter	m
(Drain Tile, _____ in. diameter	LFT)
Masonry Wall	m3 (CYS)
Masonry Tree Well	m3 (CYS)
Plant, Annual	EACH
Plant, Aquatic	EACH
Plant, Biannual	EACH
Plant, Broadleaf Evergreen, Cone, Broad Upright, ____ size	EACH
Plant, Broadleaf Evergreen, Globe, Dwarf, ____ size	EACH
Plant, Broadleaf Evergreen, Spreading, Semispreading, ____ size	EACH
Plant, Coniferous Evergreen, Cone, Broad Upright, ____ size	EACH
Plant, Coniferous Evergreen, Globe, Dwarf, ____ size	EACH
Plant, Coniferous Evergreen, Prostrate Broad Spreading, Semispreading, ____ size	EACH
Plant, Deciduous Shrub, ____ size	EACH
Plant, Deciduous Tree, Multi-Stem, ____ size	EACH
Plant, Deciduous Tree, Single Stem, ____ size	EACH
Plant, Ground Cover	EACH
Plant, Perennial	EACH
Plant, Root, Tuber, Corm, Bulb	EACH
Plant, Rose Grade	EACH
Porous Material for Root Protection	Mg (TON)
Seedling	EACH
Sign, "Do Not Disturb"	EACH
Sign, "Do Not Mow or Spray"	EACH

The costs of furnishing all materials, labor, and necessary incidentals shall be included in the costs of the pay items.

Progress payment for planting trees, shrubs, or vines will be based on the premise that 75 percent of the work has been completed when such trees, shrubs, or vines have been completely planted. The remaining portion of the payment will be for maintenance and plant replacement.